

## Uji Pemahaman 1

$$\begin{aligned} \text{[1]} \quad \cos 181^\circ &= \cos (180^\circ + 1^\circ) \\ &= -\cos 1^\circ \end{aligned}$$

Jawaban: D

$$\begin{aligned} \text{[2]} \quad \cos \alpha &= -\frac{1}{2}\sqrt{3}, \alpha \text{ di kuadran II} \\ \alpha &= 150^\circ \end{aligned}$$

$$\Rightarrow \tan 150^\circ = -\frac{1}{3}\sqrt{3}$$

Jawaban: D

$$\begin{aligned} \text{[3]} \quad \frac{\tan(-340^\circ)}{\sin 200^\circ} \cdot \cos 20^\circ &= \frac{\tan 20^\circ}{\sin (180+20)^\circ} \cdot \cos 20^\circ \\ &= \frac{\sin 20^\circ}{\cos 20^\circ} \cdot \frac{\cos 20^\circ}{-\sin 20^\circ} \\ &= -1 \end{aligned}$$

Jawaban: B

$$\begin{aligned} \text{[4]} \quad \tan x &= \frac{1}{3}\sqrt{x}, 180^\circ < x < 270^\circ \\ x &= 210^\circ \end{aligned}$$

$$\begin{aligned} \Rightarrow 3 \cos x &= 3 \cos (180^\circ + 30^\circ) \\ &= -3 \cos 30^\circ \\ &= -\frac{3}{2}\sqrt{3} \end{aligned}$$

Jawaban: D

$$\begin{aligned} \text{[5]} \quad \frac{\sqrt{2} \sin 135^\circ + 4 \cos 240^\circ}{3 \sin 330^\circ + \tan 225^\circ} &= \frac{\sqrt{2} \cdot \left(\frac{1}{2}\sqrt{2}\right) + 4 \cdot \left(-\frac{1}{2}\right)}{3 \cdot \left(-\frac{1}{2}\right) + 1} = \frac{1-2}{-\frac{3}{2}+1} = \frac{-1}{-\frac{1}{2}} \\ &= 2 \end{aligned}$$

Jawaban: C

## B. Urutan

$$\begin{aligned} \text{[1]} \quad \text{a.)} \quad \sin 225^\circ &= \sin (180 + 45)^\circ \\ &= -\sin 45^\circ \\ &= -\frac{1}{2}\sqrt{2} \end{aligned}$$

$$\begin{aligned} \text{b.)} \quad \cos 690^\circ &= \cos ((2 \times 360) - 30)^\circ \\ &= \cos 30^\circ \\ &= \frac{1}{2}\sqrt{3} \end{aligned}$$

$$\begin{aligned} \text{c.)} \quad \tan 750^\circ &= \tan (2 \times 360^\circ + 30^\circ) \\ &= \tan 30^\circ \\ &= \frac{1}{3}\sqrt{3} \end{aligned}$$

$$\begin{aligned} \text{d.)} \quad \tan 1140^\circ &= \tan (3 \times 360^\circ + 60^\circ) \\ &= \tan 60^\circ \\ &= \sqrt{3} \end{aligned}$$

$$\begin{aligned} \text{e.)} \quad \sin 1500^\circ &= \sin (4 \times 360^\circ + 60^\circ) \\ &= \sin 60^\circ \\ &= \frac{1}{2}\sqrt{3} \end{aligned}$$

$$\begin{aligned} \text{[2]} \quad \sin 300^\circ &= \sin (270 + 30)^\circ \\ \text{a.)} \quad &= -\cos 30^\circ \\ &= -\frac{1}{2}\sqrt{3} \end{aligned}$$

$$\begin{aligned} \text{b.)} \quad \cos 315^\circ &= \cos (270 + 45)^\circ \\ &= \sin 45^\circ \\ &= \frac{1}{2}\sqrt{2} \end{aligned}$$

$$\begin{aligned} \text{c.)} \quad \tan 315^\circ &= \tan (270 + 45)^\circ \\ &= -\cot 45^\circ \\ &= -1 \end{aligned}$$

$$\begin{aligned} \text{d.)} \quad \tan 330^\circ &= \tan (270 + 60)^\circ \\ &= -\cot 60^\circ \\ &= -\frac{1}{3}\sqrt{3} \end{aligned}$$

$$\begin{aligned} \boxed{3} \quad a) \sin 300^\circ &= \sin(360^\circ - 60^\circ) \\ &= -\sin 60^\circ \\ &= -\frac{1}{2}\sqrt{3} \end{aligned}$$

$$\begin{aligned} b) \cos 315^\circ &= \cos(360^\circ - 45^\circ) \\ &= \cos 45^\circ \\ &= \frac{1}{2}\sqrt{2} \end{aligned}$$

$$\begin{aligned} c) \tan 315^\circ &= \tan(360^\circ - 45^\circ) \\ &= -\tan 45^\circ \\ &= -1 \end{aligned}$$

$$\begin{aligned} d) \tan 330^\circ &= \tan(360^\circ - 30^\circ) \\ &= -\tan 30^\circ \\ &= -\frac{1}{3}\sqrt{3} \end{aligned}$$

$$\begin{aligned} \boxed{14} \quad a) \sin(-135^\circ) &= -\sin 135^\circ \\ &= -\sin(180^\circ - 45^\circ) \\ &= -\sin 45^\circ \\ &= -\frac{1}{2}\sqrt{2} \end{aligned}$$

$$\begin{aligned} b) \cos(-135^\circ) &= \cos 135^\circ \\ &= -\cos 45^\circ \\ &= -\frac{1}{2}\sqrt{2} \end{aligned}$$

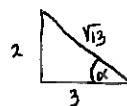
$$\begin{aligned} c) \tan(-135^\circ) &= -\tan 135^\circ \\ &= \tan 45^\circ \\ &= 1 \end{aligned}$$

$$\begin{aligned} d) \sin(-330^\circ) &= -\sin 330^\circ \\ &= \sin 30^\circ \\ &= \frac{1}{2} \end{aligned}$$

$$\begin{aligned} e) \cos(-330^\circ) &= \cos 330^\circ \\ &= \cos 30^\circ \\ &= \frac{1}{2}\sqrt{3} \end{aligned}$$

$$\begin{aligned} f) \tan(-330^\circ) &= -\tan 330^\circ \\ &= \tan 30^\circ \\ &= \frac{1}{3}\sqrt{3} \end{aligned}$$

$$\boxed{5} \quad \tan \alpha = -\frac{2}{3} \quad * \alpha \text{ kuadran II}$$



$$\Rightarrow \sin \alpha = \frac{2}{\sqrt{13}} \quad \Rightarrow \cot \alpha = -\frac{3}{2}$$

$$\Rightarrow \cos \alpha = -\frac{3}{\sqrt{13}}$$

$$a) \frac{\sin(90^\circ - \alpha) - \cos(180^\circ - \alpha)}{\tan(270^\circ + \alpha) + \cot(360^\circ - \alpha)}$$

$$\begin{aligned} &= \frac{\cos \alpha - (-\cos \alpha)}{-\cot \alpha + (-\cot \alpha)} = \frac{2 \cos \alpha}{-2 \cot \alpha} \\ &= \frac{-\frac{3}{\sqrt{13}} \sqrt{13}}{-\frac{3}{2}} \\ &= \frac{2}{13} \sqrt{13} \end{aligned}$$

$$b) \frac{\tan(90^\circ + \alpha) + \cos(180^\circ + \alpha)}{\sin(270^\circ - \alpha) - \cot(180^\circ - \alpha)}$$

$$\begin{aligned} &= \frac{-\cot \alpha + (-\cos \alpha)}{-\cos \alpha - (-\cot \alpha)} \\ &= \frac{-(-\frac{3}{2}) - (-\frac{3}{\sqrt{13}} \sqrt{13})}{\frac{3}{\sqrt{13}} \sqrt{13} + (-\frac{3}{2})} \\ &= \frac{\frac{3}{\sqrt{13}} \sqrt{13} + \frac{3}{2}}{\frac{3}{\sqrt{13}} \sqrt{13} - \frac{3}{2}} \end{aligned}$$

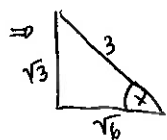
## Uji Pemahaman 2

$$1) \cos x \cdot \tan x + \frac{1}{3}\sqrt{3} = 0, \quad \frac{3}{2}\pi < x < 2\pi$$

$$\Rightarrow \cos x \cdot \frac{\sin x}{\cos x} = -\frac{1}{3}\sqrt{3}$$

kuadran 4

$$\sin x = -\frac{1}{3}\sqrt{3}$$

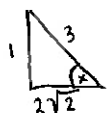


$$\Rightarrow \cos x = \frac{\sqrt{6}}{3} = \frac{1}{3}\sqrt{6}$$

Jawaban: E

$$2) \frac{1}{2}\pi < x < \pi \rightarrow \text{kuadran II}$$

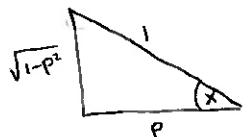
$$\sin x = \frac{1}{3}$$



$$\Rightarrow \tan x = -\frac{1}{\sqrt{2}} = -\frac{1}{\sqrt{2}}$$

Jawaban: D

$$3) 0 < x < \frac{1}{2}\pi, \quad \cos x = p$$



$$\begin{aligned} \Rightarrow \tan x + \sin x &= \frac{\sqrt{1-p^2}}{p} + \sqrt{1-p^2} \\ &= \frac{\sqrt{1-p^2} + p\sqrt{1-p^2}}{p} \\ &= \frac{1+p}{p} \sqrt{1-p^2} \end{aligned}$$

Jawaban: D

$$\begin{aligned} 4) \tan x \sin x + \cos x &= \frac{\sin x}{\cos x} \cdot (\sin x) + \cos x \\ &= \frac{\sin^2 x + \cos^2 x}{\cos x} \\ &= \frac{1}{\cos x} = \sec x \end{aligned}$$

Jawaban: E

$$\begin{aligned} 5) \frac{\sin x}{1-\cos x} \cdot \frac{1+\cos x}{1+\cos x} &= \frac{\sin x + \sin x \cos x}{1-\cos^2 x} \\ &= \frac{\sin x (1+\cos x)}{\sin^2 x} \\ &= \frac{1+\cos x}{\sin x} \end{aligned}$$

Jawaban: A

## B. Urutan

$$1) \sin \beta = \frac{1}{2}\sqrt{3}, \quad \beta \text{ tumpul}, \quad \beta = 120^\circ$$

$$\Rightarrow \cos \beta = -\frac{1}{2}$$

$$\tan \beta = -\sqrt{3}$$

$$\begin{aligned} 2) a) (1+\sin \theta)^2 + \cos^2 \theta &= 1 + 2\sin \theta + \sin^2 \theta + \cos^2 \theta \\ &= 2 + 2\sin \theta \\ &= 2(1+\sin \theta) \text{ qed} \end{aligned}$$

$$\begin{aligned} b) \frac{1-\sin \theta}{1+\sin \theta} \cdot \frac{(1-\sin \theta)}{(1-\sin \theta)} &= \frac{1-2\sin \theta + \sin^2 \theta}{1-\sin^2 \theta} \\ &= \frac{1-2\sin \theta + \sin^2 \theta}{\cos^2 \theta} \\ &= \frac{1}{\cos^2 \theta} - \frac{2\sin \theta}{\cos^2 \theta} + \frac{\sin^2 \theta}{\cos^2 \theta} \\ &= \sec^2 \theta - 2\sec \theta \tan \theta + \tan^2 \theta \\ &= (\sec \theta - \tan \theta)^2 \text{ qed} \end{aligned}$$

$$\begin{aligned} c) \frac{\cos \theta}{1+\sin \theta} + \frac{1+\sin \theta}{\cos \theta} &= \frac{\cos^2 \theta + (1+\sin \theta)^2}{(1+\sin \theta)(\cos \theta)} \\ &= \frac{\cos^2 \theta + 1 + 2\sin \theta + \sin^2 \theta}{(1+\sin \theta)(\cos \theta)} \\ &= \frac{2 + 2\sin \theta}{(1+\sin \theta)(\cos \theta)} \\ &= \frac{2(1+\sin \theta)}{\cos \theta (1+\sin \theta)} \\ &= 2 \sec \theta \text{ qed} \end{aligned}$$

$$d.) \frac{1}{\tan \theta} + \tan \theta = \frac{\cos \theta}{\sin \theta} + \frac{\sin \theta}{\cos \theta}$$

$$= \frac{\cos^2 \theta + \sin^2 \theta}{\sin \theta \cos \theta}$$

$$= \frac{1}{\sin \theta \cdot \cos \theta}$$

$$e.) \frac{1 - 2 \sin^2 \theta}{\cos \theta + \sin \theta} = \frac{\sin^2 \theta + \cos^2 \theta - 2 \sin^2 \theta}{\cos \theta + \sin \theta}$$

$$= \frac{\cos^2 \theta - \sin^2 \theta}{\cos \theta + \sin \theta}$$

$$= \frac{(\cos \theta + \sin \theta)(\cos \theta - \sin \theta)}{\cos \theta + \sin \theta}$$

$$= \cos \theta - \sin \theta \text{ qed}$$

# U<sub>3</sub> Pemahaman 3

1) a)  $90^\circ = 90 \times \frac{\pi}{180} = \frac{1}{2} \pi \text{ rad}$

b)  $15^\circ = 15 \times \frac{\pi}{180} = \frac{\pi}{12} \text{ rad}$

c)  $22,5^\circ = 22,5 \times \frac{\pi}{180} = \frac{\pi}{8} \text{ rad}$

d)  $24^\circ = 24 \times \frac{\pi}{180} = \frac{2\pi}{15} \text{ rad}$

e)  $36^\circ = 36 \times \frac{\pi}{180} = \frac{1}{5} \pi \text{ rad}$

f)  $45^\circ = 45 \times \frac{\pi}{180} = \frac{1}{4} \pi \text{ rad}$

g)  $60^\circ = 60 \times \frac{\pi}{180} = \frac{1}{3} \pi \text{ rad}$

h)  $225^\circ = 225 \times \frac{\pi}{180} = \frac{5}{4} \pi \text{ rad}$

i)  $240^\circ = 240 \times \frac{\pi}{180} = \frac{4}{3} \pi \text{ rad}$

j)  $330^\circ = 330 \times \frac{\pi}{180} = \frac{11}{6} \pi \text{ rad}$

2) a)  $\frac{1}{4} \pi \text{ rad} = \frac{\pi}{4} \times \frac{180}{\pi} = 45^\circ$

b)  $\frac{7}{8} \pi \text{ rad} = \frac{7\pi}{8} \times \frac{180}{\pi} = 157,5^\circ$

c)  $\frac{2}{3} \pi \text{ rad} = \frac{2\pi}{3} \times \frac{180}{\pi} = 120^\circ$

d)  $\frac{1}{4} \pi \text{ rad} = \frac{5\pi}{4} \times \frac{180}{\pi} = 225^\circ$

e)  $\frac{5}{6} \pi \text{ rad} = \frac{11\pi}{6} \times \frac{180}{\pi} = 330^\circ$

f)  $\frac{5}{9} \pi \text{ rad} = \frac{14\pi}{9} \times \frac{180}{\pi} = 280^\circ$

3) a)  $\sin \frac{7}{6} \pi = \sin 210^\circ = -\sin 30^\circ = -\frac{1}{2}$

b)  $\cos \frac{11}{12} \pi = \cos 165^\circ = -0,9659$

c)  $\tan \frac{5}{6} \pi = \tan 150^\circ = -\tan 30^\circ = -\frac{1}{3}\sqrt{3}$

d)  $\sin \frac{3}{4} \pi = \sin 135^\circ = \sin 45^\circ = \frac{1}{2}\sqrt{2}$

e)  $\sin 0,34 = 0,33348$

f)  $\cos 3,45 = -0,9528$

4) PQ tali busur di O dengan  $r = 7 \text{ cm}$   
 $PQ = 10 \text{ cm}$

a)  $\angle POQ = \frac{10}{7} = 1,42 \text{ rad}$

b)  $1,42 \text{ rad} = 81,36^\circ$

$\angle POQ \text{ besar} = 360^\circ - 81,36^\circ$   
 $= 278,64^\circ$   
 $= 4,86 \text{ rad}$

PQ besar =  $\angle POQ \text{ besar} \times r$   
 $= (4,86) \times 7$   
 $= 34,02 \text{ cm}$

5)  $\sin \frac{1}{2} \theta = \frac{OR}{r}$   
 $OR = r \cdot \sin \frac{1}{2} \theta$



a)  $PR = 2r \cdot \sin \frac{1}{2} \theta$   
 $PQR = \theta \cdot r$

b)  $t_A = t_B$   
 $\frac{S_A}{V_A} = \frac{S_B}{V_B}$

$\frac{2r \sin \frac{1}{2} \theta}{6} = \frac{\theta \cdot r}{10}$

$10 \sin \frac{1}{2} \theta = 3\theta$

$\sin \frac{1}{2} \theta = \frac{3}{10} \cdot \theta$

$\therefore k = \frac{3}{10}$

c)  $\theta = 3,2 \text{ rad}$

$t_A = \frac{2 \sin \frac{1}{2} (3,2) \cdot r}{6}$   
 $= 0,33 r \text{ detik}$

$t_B = \frac{(3,2) \cdot r}{10}$   
 $= 0,32 \text{ detik}$

# Uji Pemahaman 4

1  $f(x) = 4 \sin \left( \frac{2}{3}x + \pi \right)$

Periode =  $\frac{2\pi}{\frac{2}{3}} = 3\pi$

Jawaban : E

2  $y = -2 \cos \left( 3x + \frac{\pi}{4} \right), 0 \leq x \leq 2\pi$

Nilai maks =  $|-2| = 2$

$\Rightarrow 2 = -2 \cos \left( 3x + \frac{\pi}{4} \right)$

$-1 = \cos \left( 3x + \frac{\pi}{4} \right)$

$\cos \pi = \cos \left( 3x + \frac{\pi}{4} \right)$

$\Rightarrow \pi = 3x + \frac{\pi}{4}$

$\frac{3}{4}\pi = 3x$

$\frac{\pi}{4} = x$

$\therefore$  Titik maksimum di  $\left( \frac{\pi}{4}, 2 \right)$

Jawaban : C

3  $y = \frac{1}{3} \cos \left( x + \frac{\pi}{3} \right), 0 \leq x \leq 2\pi$

$0 = \frac{1}{3} \cos \left( x + \frac{\pi}{3} \right)$

$0 = \cos \left( x + \frac{\pi}{3} \right)$

$\Rightarrow \frac{\pi}{2} = x + \frac{\pi}{3}$

$\frac{\pi}{6} = x$

$\therefore$  Titik potong di  $\left( \frac{1}{6}\pi, 0 \right)$

Jawaban : B

4 Grafik  $y = \cos x$  yang digeser ke kiri  $30^\circ$

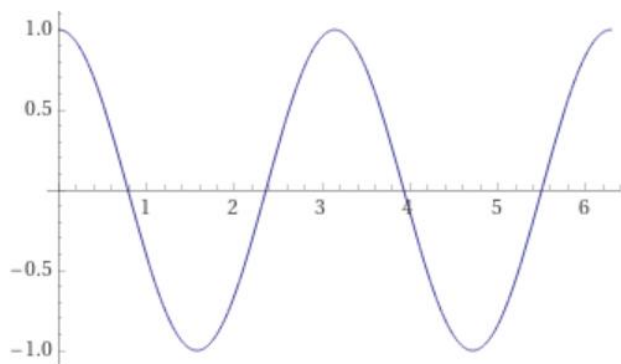
$\therefore y = \cos(x + 30^\circ)$

Jawaban : C

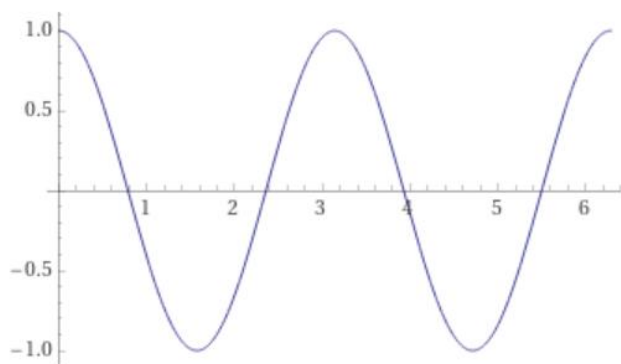
5  $y = -2 \sin \left( 2x + \frac{\pi}{2} \right)$

Jawaban : C

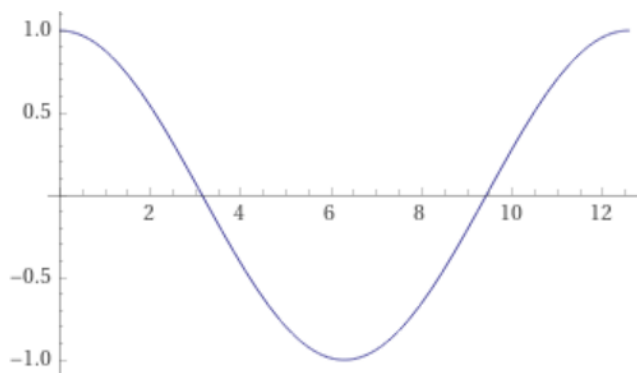
1. a.  $y = \cos 2x, 0^\circ \leq x \leq 360^\circ$



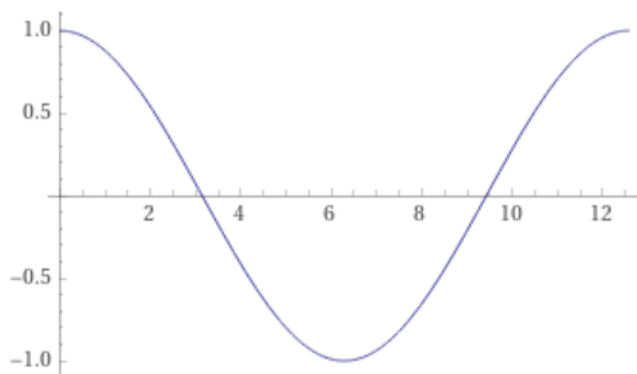
b.  $y = \cos(-2x), 0^\circ \leq x \leq 360^\circ$



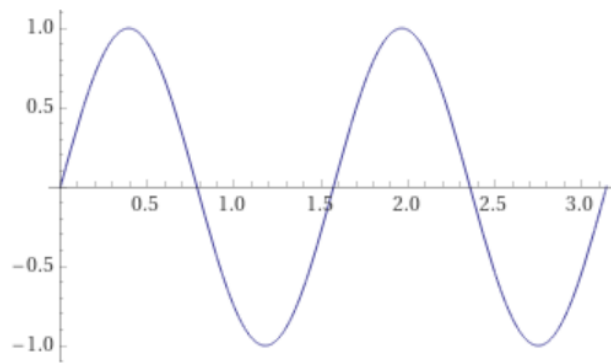
c.  $y = \cos \frac{1}{2}x, 0^\circ \leq x \leq 720^\circ$



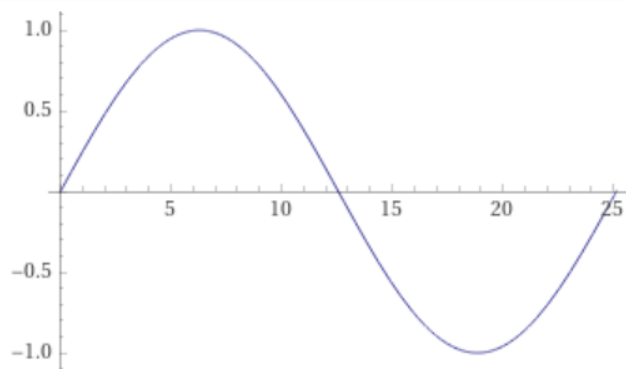
d.  $y = \cos\left(-\frac{1}{2}x\right), 0^\circ \leq x \leq 720^\circ$



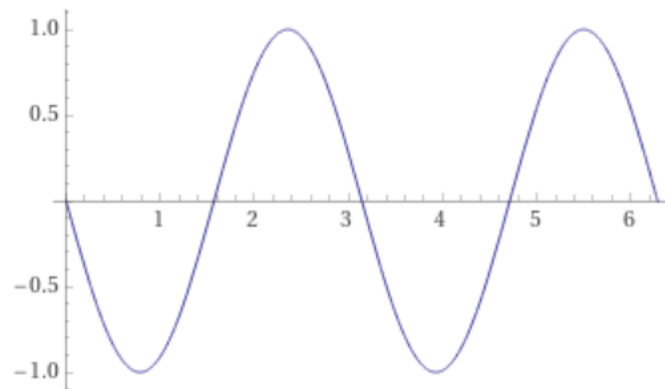
2. a.  $y = \sin 4x, 0^\circ \leq x \leq 180^\circ$



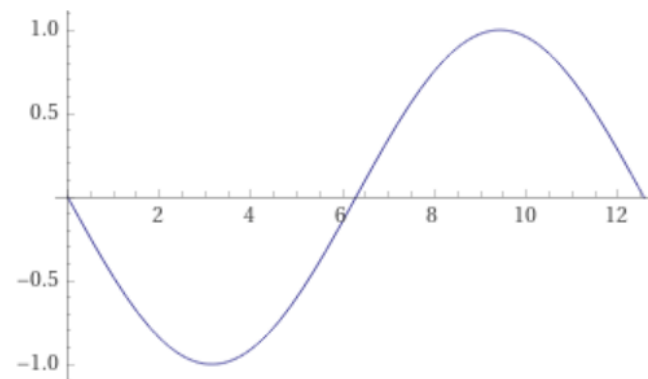
b.  $y = \sin \frac{x}{4}, 0^\circ \leq x \leq 1440^\circ$



c.  $y = \sin(-2x), 0^\circ \leq x \leq 360^\circ$



d.  $y = \sin\left(-\frac{1}{2}x\right), 0^\circ \leq x \leq 720^\circ$



# Soal Model AKM

$$f(x) = a \sin kx$$

I. Putri Duyung

$$a = 4$$

$$f_1(x) = 4 \sin kx$$

$$\rightarrow f_1(3) = 4 \sin 3k$$

$$2 = 4 \sin 3k$$

$$\frac{1}{2} = \sin 3k$$

$$3k = 30$$

$$k = 10$$

$$\Rightarrow f_1(x) = 4 \sin 10x$$

II. Tunggai Jaya

$$a = 6$$

$$f_2(x) = 6 \sin kx$$

$$\Rightarrow 6k = 90$$

$$k = 15$$

$$f_2(6) = 6 \sin 6k$$

$$6 = 6 \sin 6k$$

$$1 = \sin 6k$$

$$\Rightarrow f_2(x) = 6 \sin 15x$$

III. Samudera Indah

$$a = 10$$

$$f_3(x) = 10 \sin kx$$

$$\Rightarrow 15k = 90$$

$$k = 6$$

$$f_3(15) = 10 \sin 15k$$

$$10 = 10 \sin 15k$$

$$1 = \sin 15k$$

$$\Rightarrow f_3(x) = 10 \sin 6x$$

$$1) X = 6^\circ \rightarrow f_1(x) = 4 \sin 60^\circ = 3,4 \quad (D)$$

$$ii) X = 15^\circ \rightarrow f_1(x) = 4 \sin 150^\circ = 2 \quad (A)$$

$$iii) X = 3^\circ \rightarrow f_2(x) = 6 \sin 30^\circ = 4,2 \quad (E)$$

$$iv) X = 10^\circ \rightarrow f_2(x) = 6 \sin 150^\circ = 3 \quad (C)$$

$$v) X = 25^\circ \rightarrow f_3(x) = 10 \sin 150^\circ = 5 \quad (F)$$

$$2) f_1(3) = 4 \sin 30^\circ = 2$$

$$f_2(3) = 6 \sin 30^\circ = 4,2$$

$$i) f_2(3) - f_1(3) = 2,2 \quad (\text{Salah})$$

$$f_1(6) = 4 \sin 60^\circ = 3,4$$

$$f_2(6) = 6 \sin 90^\circ = 6$$

$$ii) f_1(6) + f_2(6) = 9,4 \quad (\text{Benar})$$

$$f_1(9) = 4 \sin 90^\circ = 4$$

$$f_2(9) = 6 \sin 135^\circ = 4,2$$

$$iii) f_1(9) + f_2(9) = 8,2 \quad (\text{Salah})$$

$$f_2(10) = 6 \sin 150^\circ = 3$$

$$f_3(10) = 10 \sin 60^\circ = 8,5$$

$$\Rightarrow f_3(10) - f_2(10) = 8,5 - 3 = 5,5$$

IV) Salah

v) Salah

$$3) f_3(x) = 10 \sin 6x$$

$$f_3(20) = 10 \sin 120^\circ = 8,5 \text{ kuintal} \\ = 850 \text{ kg}$$

$$\Rightarrow \text{Harga jual} = 850 \times \text{Rp. } 5.000 \\ = \text{Rp. } 4.250.000$$

Jawaban : A



## Latihan Soal Akhir Bab 4

$$\begin{aligned}\boxed{1} \quad \cos 1690^\circ &= \cos (4 \times 360^\circ + 250^\circ) \\ &= \cos 250^\circ \\ &= \cos (180^\circ + 70^\circ) \\ &= -\cos 70^\circ\end{aligned}$$

Jawaban : A

$$\begin{aligned}\boxed{2} \quad \sin 2022^\circ &= \sin (5 \times 360^\circ + 222^\circ) \\ &= \sin 222^\circ \\ &= \sin (180^\circ + 42^\circ) \\ &= -\sin 42^\circ\end{aligned}$$

Jawaban : B

$$\begin{aligned}\boxed{3} \quad \cos (-610)^\circ &= \cos (-2 \times 360^\circ + 110^\circ) \\ &= \cos 110^\circ \\ &= \cos (180^\circ - 70^\circ) \\ &= -\cos 70^\circ\end{aligned}$$

Jawaban : E

$$\begin{aligned}\boxed{4} \quad \sin 120^\circ \cdot \cos 330^\circ &= \sin (180^\circ - 60^\circ) \cdot \cos (360^\circ - 30^\circ) \\ &= \sin 60^\circ \cdot \cos 30^\circ \\ &= \frac{1}{2} \sqrt{3} \cdot \frac{1}{2} \sqrt{3} \\ &= \frac{3}{4}\end{aligned}$$

Jawaban : E

$$\begin{aligned}\boxed{5} \quad \tan 330^\circ - \tan 60^\circ &= \tan (360^\circ - 30^\circ) - \tan 60^\circ \\ &= -\tan 30^\circ - \tan 60^\circ \\ &= -\frac{1}{3} \sqrt{3} - \sqrt{3} \\ &= -\frac{4}{3} \sqrt{3}\end{aligned}$$

Jawaban : A

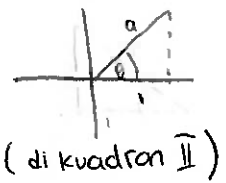
$$\boxed{6} \quad \frac{\sin 60^\circ \cdot \cos 135^\circ \cdot \tan 135^\circ}{\sin 150^\circ \cdot \cos 225^\circ}$$

$$\begin{aligned}&= \frac{\sin 60^\circ (-\cos 45^\circ) \cdot (-\tan 45^\circ)}{\sin 30^\circ \cdot (-\cos 45^\circ)} \\ &= \frac{\frac{1}{2} \sqrt{3} (-1)}{\frac{1}{2}} \\ &= -\sqrt{3}\end{aligned}$$

Jawaban : B

$$\boxed{7} \quad \cos \theta = \frac{1}{a}$$

$$\begin{aligned}\Rightarrow \tan \theta &= -\left(\frac{\sqrt{a^2-1}}{1}\right) \\ &= -\sqrt{a^2-1}\end{aligned}$$



Jawaban : C

$$\boxed{8} \quad \tan x = -\sqrt{3}, \cos x = \dots? \text{ (untuk } x < \text{tumpul)}$$

$$\Rightarrow \tan x = -\sqrt{3}$$

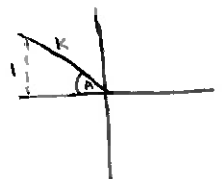
$$x = \{120^\circ, 330^\circ\}$$

$$\begin{aligned}\Rightarrow \cos x &= \cos 120^\circ = \cos (180^\circ - 60^\circ) \\ &= -\cos 60^\circ \\ &= -\frac{1}{2}\end{aligned}$$

Jawaban : C

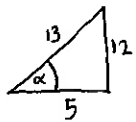
$$\boxed{9} \quad \sin A = \frac{1}{k}, A \text{ sudut tumpul (di kuadran II)}$$

$$\Rightarrow \cos A = -\frac{\sqrt{k^2-1}}{k}$$



Jawaban : A

10.  $\cos \alpha = \frac{5}{13}$ ,  $\alpha$  sudut lancip



$$\Rightarrow 2 \cdot \sin \alpha = 2 \cdot \frac{12}{13}$$

$$= \frac{24}{13}$$

Jawaban : A

11.  $\sin A = \frac{12}{13}$ , A sudut tumpul

$\Rightarrow$  karena A sudut tumpul nilai  $\cos A$  negatif

$$\Rightarrow 2 \cdot \sin A \cdot \cos A = 2 \cdot \frac{12}{13} \cdot \left(-\frac{5}{13}\right)$$

$$= -\frac{120}{169}$$

Jawaban : B

12.  $\frac{\sin^4 x - \cos^4 x}{\tan^2 x - 1} = \frac{(\sin^2 x + \cos^2 x)(\sin^2 x - \cos^2 x)}{\left(\frac{\sin^2 x}{\cos^2 x}\right) - 1}$

$$\Rightarrow \frac{\sin^2 x - \cos^2 x}{\left(\frac{\sin^2 x - \cos^2 x}{\cos^2 x}\right)} = \frac{(\sin^2 x - \cos^2 x) \cdot \cos^2 x}{(\sin^2 x - \cos^2 x)}$$

$$= \cos^2 x$$

Jawaban : A

13.  $\frac{(\sin x - \cos x)^2 + \sin x \cos x}{\sin x}$

$$\Rightarrow \frac{\sin^2 x - 2 \sin x \cos x + \cos^2 x + \sin x \cos x}{\sin x}$$

$$\Rightarrow \frac{1 - \sin x \cos x}{\sin x} = \frac{1}{\sin x} - \cos x$$

$$= \csc x - \cos x$$

Jawaban : D

14.  $\frac{\sin x}{1 - \cos x} = \frac{\sin x}{1 - \cos x} \cdot \frac{1 + \cos x}{1 + \cos x}$

$$= \frac{\sin x (1 + \cos x)}{1^2 - \cos^2 x}$$

$$= \frac{\sin x (1 + \cos x)}{\sin^2 x}$$

$$= \frac{1 + \cos x}{\sin x}$$

Jawaban : A

15. (i)  $\cos^2 A (1 + \tan^2 A) = \cos^2 A + \cos^2 A \cdot \frac{\sin^2 A}{\cos^2 A}$

$$= \cos^2 A + \sin^2 A$$

$$= 1$$

$\Rightarrow$  pernyataan (i) benar

(ii)  $\frac{\sin A + \tan A}{1 + \cos A} = \frac{\sin A + \frac{\sin A}{\cos A}}{1 + \cos A}$

$$= \frac{\frac{\sin A \cos A + \sin A}{\cos A}}{1 + \cos A}$$

$$= \frac{\sin A (\cos A + 1)}{\cos A (1 + \cos A)}$$

$$= \frac{\tan A (\cos A + 1)}{1 + \cos A}$$

$$= \tan A$$

$\Rightarrow$  pernyataan (ii) benar

(iii)  $\frac{\cos^2 A}{1 - \sin A} - \frac{\cos^2 A}{1 + \sin A} = \frac{\cos^2 A (1 + \sin A) - \cos^2 A (1 - \sin A)}{(1 - \sin A)(1 + \sin A)}$

$$\Rightarrow \frac{\cos^2 A \{(1 + \sin A) - (1 - \sin A)\}}{1^2 - \sin^2 A} = \frac{\cos^2 A (2 \sin A)}{\cos^2 A}$$

$$= 2 \sin A$$

$\Rightarrow$  pernyataan (iii) benar

Jawaban : E

16.  $f(x) = 2 \sin 2x - 1$  memotong sumbu x

pada interval  $180^\circ \leq x \leq 270^\circ$

$\Rightarrow$  memotong sumbu x  $\rightarrow y=0$

$$2 \sin 2x - 1 = 0$$

$$2 \sin 2x = 1$$

$$\sin 2x = \frac{1}{2}$$

$$\Rightarrow \sin 2x = \sin 30$$

$$2x = 30 + k \cdot 360$$

$$x = 15 + k \cdot 180$$

$$\Rightarrow k=1 \rightarrow x = 195^\circ$$

$$\Rightarrow \sin 2x = \sin(180-30)$$

$$2x = 150 + k \cdot 360$$

$$x = 75 + k \cdot 180$$

$$\Rightarrow k=1 \rightarrow x = 255^\circ$$

$\therefore$  nilai x yang memenuhi adalah  $195^\circ$  dan  $255^\circ$

Jawaban : B

17. Grafik tersebut merupakan

$$\text{grafik } y = 2 \cos 2x$$

Jawaban : D

18. A terletak di kuadran II

$$\sin A = \frac{1}{2}$$

$$A = 150^\circ$$

$$\therefore \text{koordinat } A = (150^\circ, \frac{1}{2})$$

Jawaban : C

19. Grafik tsb merupakan grafik  $y = 2 \sin x$

yang digeser ke kiri sejauh  $\frac{\pi}{2}$

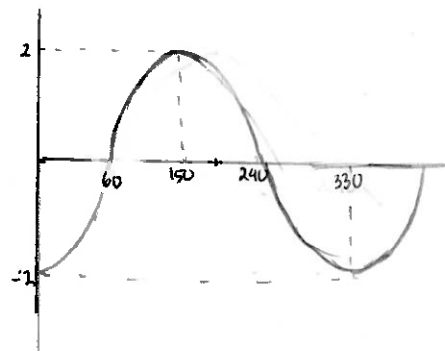
$$\therefore y = 2 \sin (x + \frac{1}{2} \pi)$$

Jawaban : E

20.  $y = 2 \sin (x - 60^\circ)$

$\Rightarrow$  amplitudo 2

$\Rightarrow$  grafik di geser ke kanan sejauh  $60^\circ$



Jawaban : A

21.  $f(x) = 6 \cos x + 4$

nilai maks = a

nilai min = b

$$a \cdot b = \dots ?$$

$$\Rightarrow \text{nilai maksimum} = 6 \cdot 1 + 4 = 10$$

$$\text{nilai minimum} = 6 \cdot (-1) + 4 = -2$$

$$\therefore a \cdot b = 10 \cdot (-2) = -20$$

Jawaban : D

22.  $f(x) = 4 \sin x + 4 \cos x$ ,  $0 \leq x \leq 2\pi$

$\rightarrow f(x)$  mencapai maks/min jika  $f'(x) = 0$

$$f'(x) = 4 \cos x - 4 \sin x = 0$$

$$4 \cos x = 4 \sin x$$

$$\frac{4}{4} = \frac{\sin x}{\cos x}$$

$$1 = \tan x$$

$$x = \{45^\circ, 225^\circ\} \rightarrow x = \left\{ \frac{\pi}{4}, \frac{5\pi}{4} \right\}$$

Jawaban : B

23)  $f(x) = -\cos 2x - \frac{1}{2}\sqrt{2}$  memotong sb  $x$

pada interval  $\frac{\pi}{2} \leq x \leq \pi$

$$\Rightarrow -\cos 2x - \frac{1}{2}\sqrt{2} = 0$$

$$-\cos 2x = \frac{1}{2}\sqrt{2}$$

$$\cos 2x = -\frac{1}{2}\sqrt{2}$$

$$\Rightarrow \cos 2x = \cos (180^\circ - 45^\circ)$$

$$= \cos 135^\circ = \cos \frac{3}{4}\pi$$

$$\Rightarrow 2x = \pm \frac{3}{4}\pi + k \cdot 2\pi$$

$$x = \pm \frac{3}{8}\pi + k \cdot \pi$$

$$k=0 \rightarrow x = \frac{3}{8}\pi \text{ atau } x = -\frac{3}{8}\pi \text{ (tidak dalam interval)}$$

$$k=1 \rightarrow x = \frac{11}{8}\pi \text{ (tidak dalam interval)}$$

$$x = \frac{5}{8}\pi$$

$\therefore$  nilai  $x$  yang memenuhi adalah  $\frac{5}{8}\pi$

Jawaban : C

24) grafik tersebut merupakan

grafik  $y = 4 \sin 2x$

Jawaban : B

25) Grafik tersebut merupakan

grafik  $y = 4 \cos 2\left(x - \frac{\pi}{4}\right)$

Jawaban : E

## B. Uraian

1) a.)  $75^\circ = 75 \times \frac{\pi}{180} = \frac{5}{12}\pi \text{ rad}$

b.)  $130^\circ = 130 \times \frac{\pi}{180} = \frac{13}{18}\pi \text{ rad}$

c.)  $225^\circ = 225 \times \frac{\pi}{180} = \frac{5}{4}\pi \text{ rad}$

d.)  $46^\circ 18' 30'' = 46^\circ.18' \left(\frac{30}{60}\right)'$   
 $= 46^\circ 18,5'$   
 $= 46^\circ \left(\frac{18,5}{60}\right)'$   
 $= 46,3083^\circ$   
 $= 46,3083 \cdot \frac{\pi}{180}$   
 $= 0,257\pi \text{ rad}$

2)  $\sin \beta = \frac{1}{2}\sqrt{3}$ ,  $\beta$  sudut tumpul.

$$\cos \beta = \dots?$$

$$\tan \beta = \dots?$$

$$\Rightarrow \beta \text{ di kuadran II}$$

$$\sin \beta = \frac{1}{2}\sqrt{3}$$

$$\beta = 120^\circ$$

$$\Rightarrow \cos 120^\circ = -\cos 60^\circ$$

$$= -\frac{1}{2}$$

$$\Rightarrow \tan 120^\circ = -\tan 60^\circ$$

$$= -\sqrt{3}$$

3) a.)  $\sin 225^\circ = \sin (180^\circ + 45^\circ)$   
 $= -\sin 45^\circ$   
 $= -\frac{1}{2}\sqrt{2}$

b.)  $\cos 690^\circ = \cos (2 \cdot 360^\circ - 30^\circ)$   
 $= \cos 30^\circ$   
 $= \frac{1}{2}\sqrt{3}$

$$\begin{aligned} \text{c.) } \tan 750^\circ &= \tan(2 \times 360^\circ + 30^\circ) \\ &= \tan 30^\circ \\ &= \frac{1}{3} \sqrt{3} \end{aligned}$$

$$\begin{aligned} \text{d.) } \tan 1.140^\circ &= \tan(3 \times 360^\circ + 60^\circ) \\ &= \tan 60^\circ \\ &= \sqrt{3} \end{aligned}$$

$$\begin{aligned} \text{e.) } \sin 1.500^\circ &= \sin(4 \times 360^\circ + 60^\circ) \\ &= \sin 60^\circ \\ &= \frac{1}{2} \sqrt{3} \end{aligned}$$

$$\begin{aligned} \boxed{41} \text{ a.) } \sin 45^\circ + \cos 135^\circ &= \sin 45^\circ + \cos(180^\circ - 45^\circ) \\ &= \sin 45^\circ - \cos 45^\circ \\ &= \frac{1}{2} \sqrt{2} - \frac{1}{2} \sqrt{2} \\ &= 0 \end{aligned}$$

$$\begin{aligned} \text{b.) } \tan^2 45^\circ + 8 \cos^2 60^\circ &= (1)^2 + 8 \cdot \left(\frac{1}{2}\right)^2 \\ &= 1 + 2 \\ &= 3 \end{aligned}$$

$$\begin{aligned} \text{c.) } (\cos 150^\circ + \sin 150^\circ)^2 &= [\cos(180^\circ - 30^\circ) + \sin(180^\circ - 30^\circ)]^2 \\ &= [-\cos 30^\circ + \sin 30^\circ]^2 \\ &= \left(-\frac{1}{2} \sqrt{3} + \frac{1}{2}\right)^2 \\ &= \frac{3}{4} - \frac{1}{2} \sqrt{3} + \frac{1}{4} \\ &= 1 - \frac{1}{2} \sqrt{3} \end{aligned}$$

$$\begin{aligned} \text{d.) } (\tan^2 60^\circ - \sin^2 60^\circ) \cot^2 60^\circ &= \left((\sqrt{3})^2 - \left(\frac{1}{2} \sqrt{3}\right)^2\right) \cdot \left(\frac{1}{3} \sqrt{3}\right)^2 \\ &= \left(3 - \frac{3}{4}\right) \cdot \left(\frac{3}{9}\right) = \frac{9}{4} \cdot \frac{1}{3} \\ &= \frac{3}{4} \end{aligned}$$

$$\begin{aligned} \boxed{5} \text{ a.) } (1 + \sin \theta)^2 + \cos^2 \theta &= 1 + 2 \sin \theta + \sin^2 \theta + \cos^2 \theta \\ &= 1 + 2 \sin \theta + 1 \\ &= 2 + 2 \sin \theta \\ &= 2(1 + \sin \theta) \text{ terbukti } // \end{aligned}$$

$$\begin{aligned} \text{b.) } \frac{1 - \sin \theta}{1 + \sin \theta} &= \frac{1 - \sin \theta}{1 + \sin \theta} \cdot \frac{(1 - \sin \theta)}{(1 - \sin \theta)} \\ &= \frac{1 - 2 \sin \theta + \sin^2 \theta}{1 - \sin^2 \theta} \\ &= \frac{1 - 2 \sin \theta + \sin^2 \theta}{\cos^2 \theta} \\ &= \sec^2 \theta - 2 \sec \theta \tan \theta + \tan^2 \theta \\ &= (\sec \theta - \tan \theta)^2 \text{ terbukti } // \end{aligned}$$

$$\begin{aligned} \text{c.) } \frac{\cos \theta}{1 + \sin \theta} + \frac{1 + \sin \theta}{\cos \theta} &= \frac{\cos \theta}{1 + \sin \theta} \cdot \frac{(1 - \sin \theta)}{(1 - \sin \theta)} + \frac{1 + \sin \theta}{\cos \theta} \\ &= \frac{\cos \theta - \cos \theta \sin \theta}{1 - \sin^2 \theta} + \frac{1 + \sin \theta}{\cos \theta} \\ &= \frac{\cos \theta - \cos \theta \sin \theta}{\cos^2 \theta} + \frac{1 + \sin \theta}{\cos \theta} \\ &= \frac{\cos \theta - \cos \theta \sin \theta + (1 + \sin \theta) \cos \theta}{\cos^2 \theta} \\ &= \frac{\cos \theta - \cos \theta \sin \theta + \cos \theta + \cos \theta \sin \theta}{\cos^2 \theta} \\ &= \frac{2 \cos \theta}{\cos^2 \theta} \\ &= \frac{2}{\cos \theta} \\ &= 2 \sec \theta \text{ terbukti } // \end{aligned}$$

$$d.) \frac{\cot \theta + \tan \beta}{\cot \beta + \tan \theta}$$

$$= \left( \frac{\cos \theta}{\sin \theta} + \frac{\sin \beta}{\cos \beta} \right) : \left( \frac{\cos \beta}{\sin \beta} + \frac{\sin \theta}{\cos \theta} \right)$$

$$= \left( \frac{\cos \theta \cos \beta + \sin \theta \sin \beta}{\sin \theta \cos \beta} \right) : \left( \frac{\cos \beta \cos \theta + \sin \theta \sin \beta}{\sin \beta \cos \theta} \right)$$

$$= \frac{\cos \theta \cos \beta + \sin \theta \sin \beta}{\sin \theta \cos \beta} \times \frac{\sin \beta \cos \theta}{\cos \beta \cos \theta + \sin \theta \sin \beta}$$

$$= \frac{\sin \beta \cos \theta}{\sin \theta \cos \beta}$$

$$= \tan \beta \cdot \cot \theta \text{ terbukti,}$$

$$e.) \frac{\cos \theta - 1}{\sec \theta + \tan \theta} + \frac{\cos \theta + 1}{\sec \theta - \tan \theta}$$

$$= \frac{(\cos \theta - 1)(\sec \theta - \tan \theta) + (\cos \theta + 1)(\sec \theta + \tan \theta)}{(\sec \theta + \tan \theta)(\sec \theta - \tan \theta)}$$

$$= \frac{(\cos \theta \sec \theta - \cos \theta \tan \theta - \sec \theta + \tan \theta) + (\cos \theta \sec \theta + \cos \theta \tan \theta)}{\sec^2 \theta - \tan^2 \theta}$$

$$+ \frac{\sec \theta + \tan \theta}{\sec^2 \theta - \tan^2 \theta}$$

$$= \frac{1 + \tan \theta + 1 + \tan \theta}{1}$$

$$= 2 + 2 \tan \theta$$

$$= 2(1 + \tan \theta) \text{ terbukti,}$$

$$f.) \frac{1 + \sin \theta}{\cos \theta} + \frac{\cos \theta}{1 - \sin \theta} = \frac{1 + \sin \theta}{\cos \theta} + \frac{\cos \theta}{1 - \sin \theta} \cdot \frac{1 + \sin \theta}{1 + \sin \theta}$$

$$= \frac{1 + \sin \theta}{\cos \theta} + \frac{\cos \theta (1 + \sin \theta)}{1^2 - \sin^2 \theta}$$

$$= \frac{1 + \sin \theta}{\cos \theta} + \frac{\cos \theta (1 + \sin \theta)}{\cos^2 \theta}$$

$$= \frac{\cos \theta (1 + \sin \theta) + \cos \theta (1 + \sin \theta)}{\cos^2 \theta}$$

$$= \frac{2 \cos \theta (1 + \sin \theta)}{\cos^2 \theta} = \frac{2(1 + \sin \theta)}{\cos \theta}$$

$$= 2(\sec \theta + \tan \theta) \text{ terbukti,}$$

$$g.) \frac{1}{\tan \theta} + \tan \theta = \frac{\cos \theta}{\sin \theta} + \frac{\sin \theta}{\cos \theta}$$

$$= \frac{\cos^2 \theta + \sin^2 \theta}{\sin \theta \cos \theta}$$

$$= \frac{1}{\sin \theta \cos \theta} \text{ terbukti,}$$

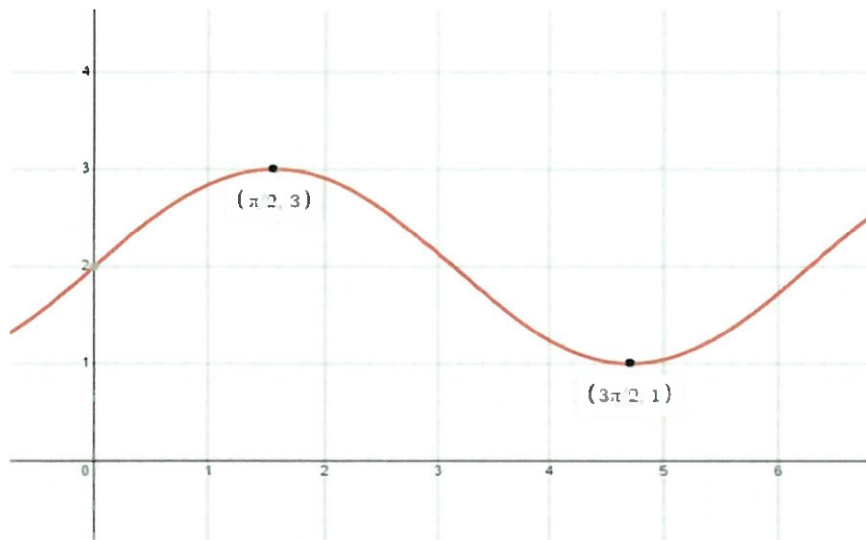
$$h.) \frac{1 - 2 \sin^2 \theta}{\cos \theta + \sin \theta} = \frac{1 - \sin^2 \theta - \sin^2 \theta}{\cos \theta + \sin \theta}$$

$$= \frac{\cos^2 \theta - \sin^2 \theta}{\cos \theta + \sin \theta}$$

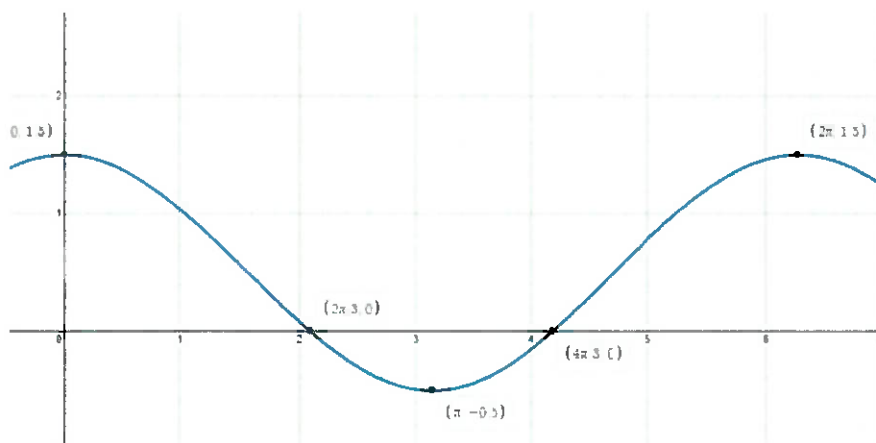
$$= \frac{(\cos \theta + \sin \theta)(\cos \theta - \sin \theta)}{\cos \theta + \sin \theta}$$

$$= \cos \theta - \sin \theta \text{ terbukti,}$$

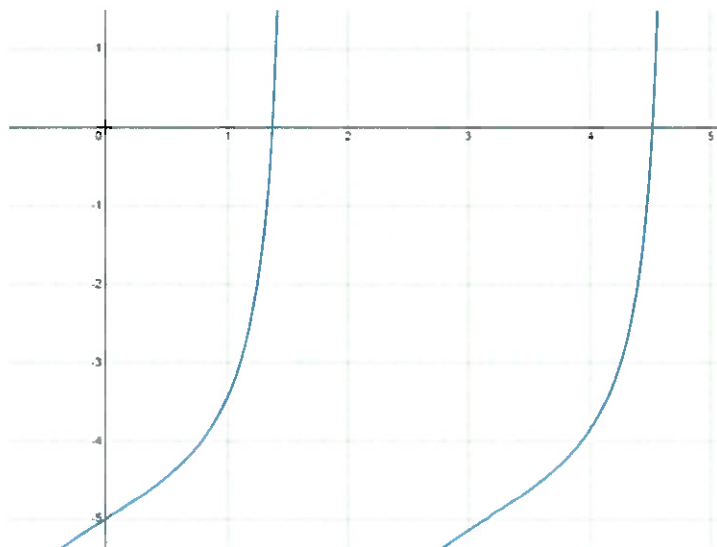
6. a.)  $y = \sin x + 2$



b.)  $y = \cos x + \frac{1}{2}$



c.)  $y = \tan x - 5$



7 Tentukan koordinat titik maksimum, minimum dan titik potong

a.)  $f(x) = 2 \cos(x - \frac{1}{2}\pi)$

$\Rightarrow$  nilai maks = 2

$\Rightarrow$  nilai min = -2

$\Rightarrow 2 = 2 \cos(x - \frac{1}{2}\pi)$

$1 = \cos(x - \frac{1}{2}\pi)$

$\Rightarrow x - \frac{1}{2}\pi = 0$

$x = \frac{\pi}{2} \therefore$  koordinat titik maksimum adalah  $(\frac{\pi}{2}, 2)$

$\Rightarrow -2 = 2 \cos(x - \frac{1}{2}\pi)$

$-1 = \cos(x - \frac{1}{2}\pi)$

$\Rightarrow x - \frac{1}{2}\pi = \pi$

$x = \frac{3\pi}{2} \therefore$  koordinat titik minimum adalah  $(\frac{3\pi}{2}, -2)$

$\Rightarrow$  titik potong sumbu y,  $x=0$

$f(x) = 2 \cos(-\frac{\pi}{2})$

$= 2 \cdot 0$

$= 0 \therefore$  titik potong sb. y di  $(0, 0)$

$\Rightarrow$  titik potong sumbu x,  $y=0$

$0 = 2 \cos(x - \frac{\pi}{2})$

$0 = \cos(x - \frac{\pi}{2})$

$\Rightarrow \frac{\pi}{2} = x - \frac{\pi}{2}$

$\pi = x$

$\Rightarrow \frac{3\pi}{2} = x - \frac{\pi}{2}$

$2\pi = x$

$\therefore$  titik potong sb. x,  $y=0$  di  $(\pi, 0)$  dan  $(2\pi, 0)$

b)  $y = \sin(x - \frac{\pi}{4})$

$\Rightarrow$  nilai maksimum = 1

$\Rightarrow$  nilai minimum = -1

$\Rightarrow 1 = \sin(x - \frac{\pi}{4})$

$\sin \frac{\pi}{2} = \sin(x - \frac{\pi}{4})$

$\frac{\pi}{2} = x - \frac{\pi}{4}$

$\frac{3\pi}{4} = x$

$\therefore$  koordinat titik maksimum adalah  $(\frac{3\pi}{4}, 1)$

$\Rightarrow -1 = \sin(x - \frac{\pi}{4})$

$\sin(\frac{3\pi}{2}) = \sin(x - \frac{\pi}{4})$

$\frac{3\pi}{2} = x - \frac{\pi}{4}$

$\frac{7\pi}{4} = x$

$\therefore$  koordinat titik minimum adalah  $(\frac{7\pi}{4}, -1)$

$\Rightarrow$  titik potong sb. y,  $x=0$

$y = \sin(-\frac{\pi}{4})$

$= -0,707 \therefore$  titik potong di  $(0, -0,707)$

$\Rightarrow$  titik potong sb. x,  $y=0$

$0 = \sin(x - \frac{\pi}{4})$

$\Rightarrow \sin 0^\circ = \sin(x - \frac{\pi}{4})$

$0 = x - \frac{\pi}{4}$

$\frac{\pi}{4} = x$

$\Rightarrow \sin \pi = \sin(x - \frac{\pi}{4})$

$\pi = x - \frac{\pi}{4}$

$\frac{5\pi}{4} = x$

$\therefore$  titik potong di  $(\frac{\pi}{4}, 0)$  dan  $(\frac{5\pi}{4}, 0)$



8. a.)  $y = 2 \sin 2(x + \frac{\pi}{4})$

b.)  $y = 2 \sin 3(x + \frac{\pi}{2})$

9. Fungsi  $y = -6 \cos(2x - \frac{\pi}{2}) + 2$

$\Rightarrow y = -6 \cos 2(x - \frac{\pi}{4}) + 2$

a.) amplitudo = 6

b.) periode = 2

c.) nilai min =  $-|a| + d$   
 $= -6 + 2$   
 $= -4$

$\Rightarrow -4 = -6 \cos 2(x - \frac{\pi}{4}) + 2$

$-6 = -6 \cos(2x - \frac{\pi}{2})$

$1 = \cos(2x - \frac{\pi}{2})$

$\Rightarrow \cos 0^\circ = \cos(2x - \frac{\pi}{2})$

$2x - \frac{\pi}{2} = 0$

$2x = \frac{\pi}{2}$

$x = \frac{\pi}{4}$

$\therefore$  koordinat titik minimum adalah  $(\frac{\pi}{4}, -4)$

$\Rightarrow$  nilai maks =  $|a| + d$   
 $= 6 + 2$   
 $= 8$

$\Rightarrow 8 = -6 \cos(2x - \frac{\pi}{2}) + 2$

$6 = -6 \cos(2x - \frac{\pi}{2})$

$-1 = \cos(2x - \frac{\pi}{2})$

$\Rightarrow \cos \pi = \cos(2x - \frac{\pi}{2})$

$2x - \frac{\pi}{2} = \pi$

$2x = \frac{3\pi}{2}$

$x = \frac{3\pi}{4}$

$\therefore$  koordinat titik maks adalah  $(\frac{3\pi}{4}, 8)$

10.  $f(x) = \sqrt{2} \sin 3x + 1$

a.)  $\Rightarrow$  titik potong sb. y,  $x=0$

$f(x) = \sqrt{2} \sin 0^\circ + 1$   
 $= 1$

$\therefore$  titik nya adalah  $(0, 1)$

$\Rightarrow$  titik potong sb. x,  $y=0$

$0 = \sqrt{2} \sin 3x + 1$

$-1 = \sqrt{2} \sin 3x$

$-\frac{1}{\sqrt{2}} = \sin 3x$

$\Rightarrow \sin 3x = \sin(180^\circ + 45^\circ)$   
 $= \sin 225^\circ$   
 $= \sin \frac{5\pi}{4}$

$\Rightarrow 3x = \frac{5\pi}{4} + k \cdot 2\pi$

$x = \frac{5\pi}{12} + \frac{2}{3}\pi \cdot k$

$\Rightarrow k=0 \rightarrow x = \frac{5\pi}{12}$

$\Rightarrow k=1 \rightarrow x = \frac{13\pi}{12}$

$\Rightarrow k=2 \rightarrow x = \frac{7\pi}{4}$

$\Rightarrow \sin 3x = \sin(360^\circ - 45^\circ)$   
 $= \sin(315^\circ)$   
 $= \sin \frac{7\pi}{4}$

$\Rightarrow 3x = \frac{7\pi}{4} + k \cdot 2\pi$

$x = \frac{7\pi}{12} + \frac{2}{3}\pi \cdot k$

$\Rightarrow k=0 \rightarrow x = \frac{7\pi}{12}$

$\Rightarrow k=1 \rightarrow x = \frac{5\pi}{4}$

$\Rightarrow k=2 \rightarrow x = \frac{23\pi}{12}$

$\therefore$  Titik potongnya adalah  $(\frac{5\pi}{12}, 0), (\frac{13\pi}{12}, 0), (\frac{7\pi}{4}, 0), (\frac{7\pi}{12}, 0), (\frac{5\pi}{4}, 0)$ , dan  $(\frac{23\pi}{12}, 0)$

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$$b.) f(x) = \sqrt{2} \sin 3x + 1$$

$$\Rightarrow \text{nilai maksimum} = \sqrt{2} + 1 = a$$

$$\Rightarrow \text{nilai minimum} = -\sqrt{2} + 1 = b$$

$$\begin{aligned} \Rightarrow a^2 + b^2 &= (1 + \sqrt{2})^2 + (1 - \sqrt{2})^2 \\ &= (1 + 2\sqrt{2} + 2) + (1 - 2\sqrt{2} - 2) \\ &= 3 + 2\sqrt{2} - 1 - 2\sqrt{2} \\ &= 2 \end{aligned}$$

## Latihan Soal Akhir Bab 4

$$\begin{aligned}\boxed{1} \quad \cos 1690^\circ &= \cos (4 \times 360^\circ + 250^\circ) \\ &= \cos 250^\circ \\ &= \cos (180^\circ + 70^\circ) \\ &= -\cos 70^\circ\end{aligned}$$

Jawaban : A

$$\begin{aligned}\boxed{2} \quad \sin 2022^\circ &= \sin (5 \times 360^\circ + 222^\circ) \\ &= \sin 222^\circ \\ &= \sin (180^\circ + 42^\circ) \\ &= -\sin 42^\circ\end{aligned}$$

Jawaban : B

$$\begin{aligned}\boxed{3} \quad \cos (-610)^\circ &= \cos (-2 \times 360^\circ + 110^\circ) \\ &= \cos 110^\circ \\ &= \cos (180^\circ - 70^\circ) \\ &= -\cos 70^\circ\end{aligned}$$

Jawaban : E

$$\begin{aligned}\boxed{4} \quad \sin 120^\circ \cdot \cos 330^\circ &= \sin (180^\circ - 60^\circ) \cdot \cos (360^\circ - 30^\circ) \\ &= \sin 60^\circ \cdot \cos 30^\circ \\ &= \frac{1}{2} \sqrt{3} \cdot \frac{1}{2} \sqrt{3} \\ &= \frac{3}{4}\end{aligned}$$

Jawaban : E

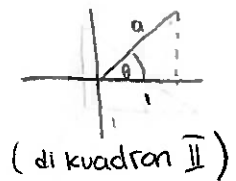
$$\begin{aligned}\boxed{5} \quad \tan 330^\circ - \tan 60^\circ &= \tan (360^\circ - 30^\circ) - \tan 60^\circ \\ &= -\tan 30^\circ - \tan 60^\circ \\ &= -\frac{1}{3} \sqrt{3} - \sqrt{3} \\ &= -\frac{4}{3} \sqrt{3}\end{aligned}$$

Jawaban : A

$$\begin{aligned}\boxed{6} \quad \frac{\sin 60^\circ \cdot \cos 135^\circ \cdot \tan 135^\circ}{\sin 150^\circ \cdot \cos 225^\circ} \\ &= \frac{\sin 60^\circ \cdot (-\cos 45^\circ) \cdot (-\tan 45^\circ)}{\sin 30^\circ \cdot (-\cos 45^\circ)} \\ &= \frac{\frac{1}{2} \sqrt{3} \cdot (-1)}{\frac{1}{2}} \\ &= -\sqrt{3}\end{aligned}$$

Jawaban : B

$$\begin{aligned}\boxed{7} \quad \cos \theta &= \frac{1}{a} \\ \Rightarrow \tan \theta &= -\frac{(\sqrt{a^2-1})}{1} \\ &= -\sqrt{a^2-1}\end{aligned}$$



Jawaban : C

$$\boxed{8} \quad \tan x = -\sqrt{3}, \cos x = \dots? \text{ (untuk } x < \text{tumpul)}$$

$$\Rightarrow \tan x = -\sqrt{3}$$

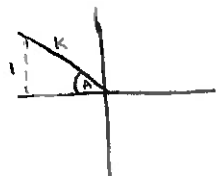
$$x = \{120^\circ, 330^\circ\}$$

$$\begin{aligned}\Rightarrow \cos x &= \cos 120^\circ = \cos (180^\circ - 60^\circ) \\ &= -\cos 60^\circ \\ &= -\frac{1}{2}\end{aligned}$$

Jawaban : C

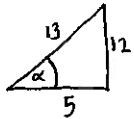
$$\boxed{9} \quad \sin A = \frac{1}{k}, A \text{ sudut tumpul (di kuadran II)}$$

$$\Rightarrow \cos A = -\frac{\sqrt{k^2-1}}{k}$$



Jawaban : A

10.  $\cos \alpha = \frac{5}{13}$ ,  $\alpha$  sudut lancip



$$\Rightarrow 2 \cdot \sin \alpha = 2 \cdot \frac{12}{13}$$

$$= \frac{24}{13}$$

Jawaban: A

11.  $\sin A = \frac{12}{13}$ , A sudut tumpul

$\Rightarrow$  karena A sudut tumpul nilai  $\cos A$  negatif

$$\Rightarrow 2 \cdot \sin A \cdot \cos A = 2 \cdot \frac{12}{13} \cdot \left(-\frac{5}{13}\right)$$

$$= -\frac{120}{169}$$

Jawaban: B

12. 
$$\frac{\sin^4 x - \cos^4 x}{\tan^2 x - 1} = \frac{(\sin^2 x + \cos^2 x)(\sin^2 x - \cos^2 x)}{\left(\frac{\sin^2 x}{\cos^2 x}\right) - 1}$$

$$\Rightarrow \frac{\sin^2 x - \cos^2 x}{\left(\frac{\sin^2 x - \cos^2 x}{\cos^2 x}\right)} = \left(\frac{\sin^2 x - \cos^2 x}{\cos^2 x}\right) \cdot \frac{\cos^2 x}{(\sin^2 x - \cos^2 x)}$$

$$= \cos^2 x$$

Jawaban: A

13. 
$$\frac{(\sin x - \cos x)^2 + \sin x \cos x}{\sin x}$$

$$\Rightarrow \frac{\sin^2 x - 2\sin x \cos x + \cos^2 x + \sin x \cos x}{\sin x}$$

$$\Rightarrow \frac{1 - \sin x \cos x}{\sin x} = \frac{1}{\sin x} - \cos x$$

$$= \csc x - \cos x$$

Jawaban: D

14. 
$$\frac{\sin x}{1 - \cos x} = \frac{\sin x}{1 - \cos x} \cdot \frac{1 + \cos x}{1 + \cos x}$$

$$= \frac{\sin x (1 + \cos x)}{1^2 - \cos^2 x}$$

$$= \frac{\sin x (1 + \cos x)}{\sin^2 x}$$

$$= \frac{1 + \cos x}{\sin x}$$

Jawaban: A

15. (i)  $\cos^2 A (1 + \tan^2 A) = \cos^2 A + \cos^2 A \cdot \frac{\sin^2 A}{\cos^2 A}$ 

$$= \cos^2 A + \sin^2 A$$

$$= 1$$

$\Rightarrow$  pernyataan (i) benar

(ii) 
$$\frac{\sin A + \tan A}{1 + \cos A} = \frac{\sin A + \frac{\sin A}{\cos A}}{1 + \cos A}$$

$$= \frac{\frac{\sin A \cos A + \sin A}{\cos A}}{1 + \cos A}$$

$$= \frac{\sin A (\cos A + 1)}{\cos A (1 + \cos A)}$$

$$= \frac{\tan A (\cos A + 1)}{1 + \cos A}$$

$$= \tan A$$

$\Rightarrow$  Pernyataan (ii) benar

(iii) 
$$\frac{\cos^2 A}{1 - \sin A} - \frac{\cos^2 A}{1 + \sin A} = \frac{\cos^2 A (1 + \sin A) - \cos^2 A (1 - \sin A)}{(1 - \sin A)(1 + \sin A)}$$

$$\Rightarrow \frac{\cos^2 A \{(1 + \sin A) - (1 - \sin A)\}}{1^2 - \sin^2 A} = \frac{\cos^2 A (2 \sin A)}{\cos^2 A}$$

$$= 2 \sin A$$

$\Rightarrow$  Pernyataan (iii) benar

Jawaban: E

16.  $f(x) = 2 \sin 2x - 1$  memotong sumbu x

Pada interval  $180^\circ \leq x \leq 270^\circ$

$\Rightarrow$  memotong sumbu x  $\rightarrow y=0$

$$2 \sin 2x - 1 = 0$$

$$2 \sin 2x = 1$$

$$\sin 2x = \frac{1}{2}$$

$$\Rightarrow \sin 2x = \sin 30^\circ$$

$$2x = 30^\circ + k \cdot 360^\circ$$

$$x = 15^\circ + k \cdot 180^\circ$$

$$\Rightarrow k=1 \rightarrow x = 195^\circ$$

$$\Rightarrow \sin 2x = \sin (180^\circ - 30^\circ)$$

$$2x = 150^\circ + k \cdot 360^\circ$$

$$x = 75^\circ + k \cdot 180^\circ$$

$$\Rightarrow k=1 \rightarrow x = 255^\circ$$

$\therefore$  nilai x yang memenuhi adalah  $195^\circ$  dan  $255^\circ$

Jawaban : B

17. Grafik tersebut merupakan

$$\text{grafik } y = 2 \cos 2x$$

Jawaban : D

18. A terletak di kuadran II

$$\sin A = \frac{1}{2}$$

$$A = 150^\circ$$

$$\therefore \text{koordinat } A = (150^\circ, \frac{1}{2})$$

Jawaban : C

19. Grafik tsb merupakan grafik  $y = 2 \sin x$

yang digeser ke kiri sejauh  $\frac{\pi}{2}$

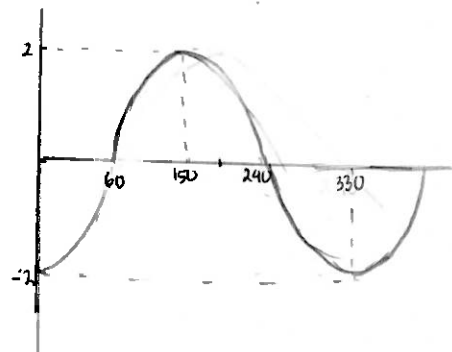
$$\therefore y = 2 \sin (x + \frac{1}{2} \pi)$$

Jawaban : E

20.  $y = 2 \sin (x - 60^\circ)$

$\Rightarrow$  amplitudo 2

$\Rightarrow$  grafik di geser ke kanan sejauh  $60^\circ$



Jawaban : A

21.  $f(x) = 6 \cos x + 4$

nilai maks = a

nilai min = b

$$a \cdot b = \dots ?$$

$$\Rightarrow \text{nilai maksimum} = 6 \cdot 1 + 4 = 10$$

$$\text{nilai minimum} = 6 \cdot (-1) + 4 = -2$$

$$\therefore a \cdot b = 10 \cdot (-2) = -20$$

Jawaban : D

22.  $f(x) = 4 \sin x + 4 \cos x$ ,  $0 \leq x \leq 2\pi$

$\rightarrow f(x)$  mencapai maks/min jika  $f'(x) = 0$

$$f'(x) = 4 \cos x - 4 \sin x = 0$$

$$4 \cos x = 4 \sin x$$

$$\frac{4}{4} = \frac{\sin x}{\cos x}$$

$$1 = \tan x$$

$$x = \{45^\circ, 225^\circ\} \rightarrow x = \left\{ \frac{\pi}{4}, \frac{5\pi}{4} \right\}$$

Jawaban : B

23)  $f(x) = -\cos 2x - \frac{1}{2}\sqrt{2}$  memotong sb  $x$

Pada interval  $\frac{\pi}{2} \leq x \leq \pi$

$$\Rightarrow -\cos 2x - \frac{1}{2}\sqrt{2} = 0$$

$$-\cos 2x = \frac{1}{2}\sqrt{2}$$

$$\cos 2x = -\frac{1}{2}\sqrt{2}$$

$$\Rightarrow \cos 2x = \cos (180^\circ - 45^\circ)$$

$$= \cos 135^\circ = \cos \frac{3}{4}\pi$$

$$\Rightarrow 2x = \pm \frac{3}{4}\pi + k \cdot 2\pi$$

$$x = \pm \frac{3}{8}\pi + k \cdot \pi$$

$$k=0 \rightarrow x = \frac{3}{8}\pi \text{ atau } x = -\frac{3}{8}\pi \text{ (tidak dalam interval)}$$

$$k=1 \rightarrow x = \frac{11}{8}\pi \text{ (tidak dalam interval)}$$

$$x = \frac{5}{8}\pi$$

$\therefore$  nilai  $x$  yang memenuhi adalah  $\frac{5}{8}\pi$

Jawaban : C

24) grafik tersebut merupakan

Grafik  $y = 4 \sin 2x$

Jawaban : B

25) Grafik tersebut merupakan

Grafik  $y = 4 \cos 2 \left( x - \frac{\pi}{4} \right)$

Jawaban : E

## B. Uraian

1) a.)  $75^\circ = 75 \times \frac{\pi}{180} = \frac{5}{12}\pi \text{ rad}$

b.)  $130^\circ = 130 \times \frac{\pi}{180} = \frac{13}{18}\pi \text{ rad}$

c.)  $225^\circ = 225 \times \frac{\pi}{180} = \frac{5}{4}\pi \text{ rad}$

d.)  $46^\circ 18' 30'' = 46^\circ.18' \left( \frac{30}{60} \right)'$   
 $= 46^\circ 18,5'$   
 $= 46^\circ \left( \frac{18,5}{60} \right)'$   
 $= 46,3083^\circ$   
 $= 46,3083 \cdot \frac{\pi}{180}$   
 $= 0,257\pi \text{ rad}$

2)  $\sin \beta = \frac{1}{2}\sqrt{3}$ ,  $\beta$  sudut tumpul

$\cos \beta = \dots?$

$\tan \beta = \dots?$

$\Rightarrow \beta$  di kuadran II

$\sin \beta = \frac{1}{2}\sqrt{3}$

$\beta = 120^\circ$

$\Rightarrow \cos 120^\circ = -\cos 60^\circ$   
 $= -\frac{1}{2}$

$\Rightarrow \tan 120^\circ = -\tan 60^\circ$   
 $= -\sqrt{3}$

3) a.)  $\sin 225^\circ = \sin (180^\circ + 45^\circ)$   
 $= -\sin 45^\circ$   
 $= -\frac{1}{2}\sqrt{2}$

b.)  $\cos 690^\circ = \cos (2 \cdot 360^\circ - 30^\circ)$   
 $= \cos 30^\circ$   
 $= \frac{1}{2}\sqrt{3}$

$$\begin{aligned} \text{c.) } \tan 750^\circ &= \tan (2 \times 360^\circ + 30^\circ) \\ &= \tan 30^\circ \\ &= \frac{1}{3} \sqrt{3} \end{aligned}$$

$$\begin{aligned} \text{d.) } \tan 1.140^\circ &= \tan (3 \times 360^\circ + 60^\circ) \\ &= \tan 60^\circ \\ &= \sqrt{3} \end{aligned}$$

$$\begin{aligned} \text{e.) } \sin 1.500^\circ &= \sin (4 \times 360^\circ + 60^\circ) \\ &= \sin 60^\circ \\ &= \frac{1}{2} \sqrt{3} \end{aligned}$$

$$\begin{aligned} \boxed{4} \text{ a.) } \sin 45^\circ + \cos 135^\circ &= \sin 45^\circ + \cos (180^\circ - 45^\circ) \\ &= \sin 45^\circ - \cos 45^\circ \\ &= \frac{1}{2} \sqrt{2} - \frac{1}{2} \sqrt{2} \\ &= 0 \end{aligned}$$

$$\begin{aligned} \text{b.) } \tan^2 45^\circ + 8 \cos^2 60^\circ &= (1)^2 + 8 \cdot \left(\frac{1}{2}\right)^2 \\ &= 1 + 2 \\ &= 3 \end{aligned}$$

$$\begin{aligned} \text{c.) } (\cos 150^\circ + \sin 150^\circ)^2 &= [\cos (180^\circ - 30^\circ) + \sin (180^\circ - 30^\circ)]^2 \\ &= [-\cos 30^\circ + \sin 30^\circ]^2 \\ &= \left(-\frac{1}{2} \sqrt{3} + \frac{1}{2}\right)^2 \\ &= \frac{3}{4} - \frac{1}{2} \sqrt{3} + \frac{1}{4} \\ &= 1 - \frac{1}{2} \sqrt{3} \end{aligned}$$

$$\begin{aligned} \text{d.) } (\tan^2 60^\circ - \sin^2 60^\circ) \cot^2 60^\circ &= \left((\sqrt{3})^2 - \left(\frac{1}{2} \sqrt{3}\right)^2\right) \cdot \left(\frac{1}{3} \sqrt{3}\right)^2 \\ &= \left(3 - \frac{3}{4}\right) \cdot \left(\frac{3}{9}\right) = \frac{9}{4} \cdot \frac{1}{3} \\ &= \frac{3}{4} \end{aligned}$$

$$\begin{aligned} \boxed{5} \text{ a.) } (1 + \sin \theta)^2 + \cos^2 \theta &= 1 + 2 \sin \theta + \sin^2 \theta + \cos^2 \theta \\ &= 1 + 2 \sin \theta + 1 \\ &= 2 + 2 \sin \theta \\ &= 2(1 + \sin \theta) \text{ terbukti } // \end{aligned}$$

$$\begin{aligned} \text{b.) } \frac{1 - \sin \theta}{1 + \sin \theta} &= \frac{1 - \sin \theta}{1 + \sin \theta} \cdot \frac{(1 - \sin \theta)}{(1 - \sin \theta)} \\ &= \frac{1 - 2 \sin \theta + \sin^2 \theta}{1 - \sin^2 \theta} \\ &= \frac{1 - 2 \sin \theta + \sin^2 \theta}{\cos^2 \theta} \\ &= \sec^2 \theta - 2 \sec \theta \tan \theta + \tan^2 \theta \\ &= (\sec \theta - \tan \theta)^2 \text{ terbukti } // \end{aligned}$$

$$\begin{aligned} \text{c.) } \frac{\cos \theta}{1 + \sin \theta} + \frac{1 + \sin \theta}{\cos \theta} &= \frac{\cos \theta}{1 + \sin \theta} \cdot \frac{(1 - \sin \theta)}{(1 - \sin \theta)} + \frac{1 + \sin \theta}{\cos \theta} \\ &= \frac{\cos \theta - \cos \theta \sin \theta}{1 - \sin^2 \theta} + \frac{1 + \sin \theta}{\cos \theta} \\ &= \frac{\cos \theta - \cos \theta \sin \theta}{\cos^2 \theta} + \frac{1 + \sin \theta}{\cos \theta} \\ &= \frac{\cos \theta - \cos \theta \sin \theta + (1 + \sin \theta) \cos \theta}{\cos^2 \theta} \\ &= \frac{\cos \theta - \cos \theta \sin \theta + \cos \theta + \cos \theta \sin \theta}{\cos^2 \theta} \\ &= \frac{2 \cos \theta}{\cos^2 \theta} \\ &= \frac{2}{\cos \theta} \\ &= 2 \sec \theta \text{ terbukti } // \end{aligned}$$

$$d.) \frac{\cot \theta + \tan \beta}{\cot \beta + \tan \theta}$$

$$= \left( \frac{\cos \theta}{\sin \theta} + \frac{\sin \beta}{\cos \beta} \right) : \left( \frac{\cos \beta}{\sin \beta} + \frac{\sin \theta}{\cos \theta} \right)$$

$$= \left( \frac{\cos \theta \cos \beta + \sin \theta \sin \beta}{\sin \theta \cos \beta} \right) : \left( \frac{\cos \beta \cos \theta + \sin \theta \sin \beta}{\sin \beta \cos \theta} \right)$$

$$= \frac{\cos \theta \cos \beta + \sin \theta \sin \beta}{\sin \theta \cos \beta} \times \frac{\sin \beta \cos \theta}{\cos \beta \cos \theta + \sin \theta \sin \beta}$$

$$= \frac{\sin \beta \cdot \cos \theta}{\sin \theta \cdot \cos \beta}$$

$$= \tan \beta \cdot \cot \theta \text{ terbukti,}$$

$$e.) \frac{\cos \theta - 1}{\sec \theta + \tan \theta} + \frac{\cos \theta + 1}{\sec \theta - \tan \theta}$$

$$= \frac{(\cos \theta - 1)(\sec \theta - \tan \theta) + (\cos \theta + 1)(\sec \theta + \tan \theta)}{(\sec \theta + \tan \theta)(\sec \theta - \tan \theta)}$$

$$= \frac{(\cos \theta \sec \theta - \cos \theta \tan \theta - \sec \theta + \tan \theta) + \cos \theta \sec \theta + \cos \theta \tan \theta}{\sec^2 \theta - \tan^2 \theta}$$

$$+ \frac{\sec \theta + \tan \theta}{\sec^2 \theta - \tan^2 \theta}$$

$$= \frac{1 + \tan \theta + 1 + \tan \theta}{1}$$

$$= 2 + 2 \tan \theta$$

$$= 2(1 + \tan \theta) \text{ terbukti,}$$

$$f.) \frac{1 + \sin \theta}{\cos \theta} + \frac{\cos \theta}{1 - \sin \theta} = \frac{1 + \sin \theta}{\cos \theta} + \frac{\cos \theta}{1 - \sin \theta} \cdot \frac{1 + \sin \theta}{1 + \sin \theta}$$

$$= \frac{1 + \sin \theta}{\cos \theta} + \frac{\cos \theta (1 + \sin \theta)}{1^2 - \sin^2 \theta}$$

$$= \frac{1 + \sin \theta}{\cos \theta} + \frac{\cos \theta (1 + \sin \theta)}{\cos^2 \theta}$$

$$= \frac{\cos \theta (1 + \sin \theta) + \cos \theta (1 + \sin \theta)}{\cos^2 \theta}$$

$$= \frac{2 \cos \theta (1 + \sin \theta)}{\cos^2 \theta} = \frac{2(1 + \sin \theta)}{\cos \theta}$$

$$= 2(\sec \theta + \tan \theta) \text{ terbukti,}$$

$$g.) \frac{1}{\tan \theta} + \tan \theta = \frac{\cos \theta}{\sin \theta} + \frac{\sin \theta}{\cos \theta}$$

$$= \frac{\cos^2 \theta + \sin^2 \theta}{\sin \theta \cdot \cos \theta}$$

$$= \frac{1}{\sin \theta \cdot \cos \theta} \text{ terbukti,}$$

$$h.) \frac{1 - 2 \sin^2 \theta}{\cos \theta + \sin \theta} = \frac{1 - \sin^2 \theta - \sin^2 \theta}{\cos \theta + \sin \theta}$$

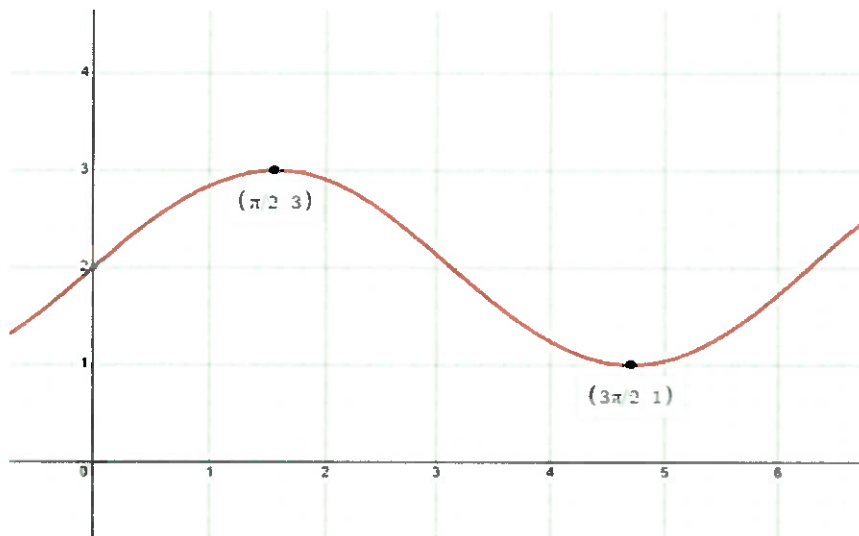
$$= \frac{\cos^2 \theta - \sin^2 \theta}{\cos \theta + \sin \theta}$$

$$= \frac{(\cos \theta + \sin \theta)(\cos \theta - \sin \theta)}{\cos \theta + \sin \theta}$$

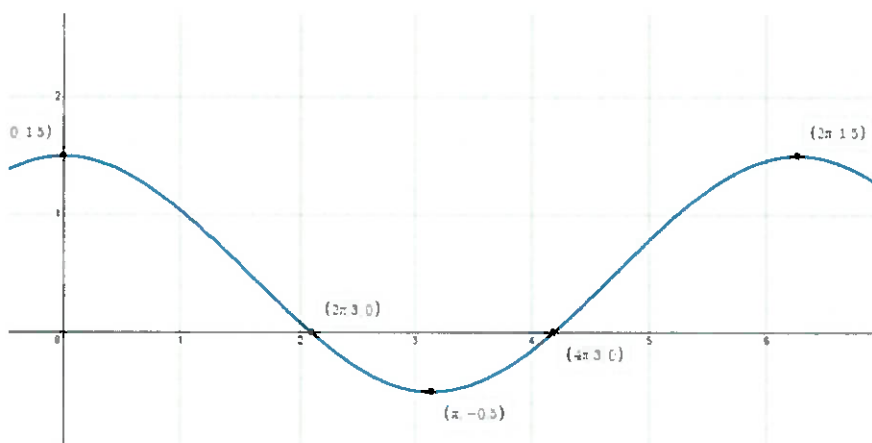
$$= \cos \theta - \sin \theta \text{ terbukti,}$$



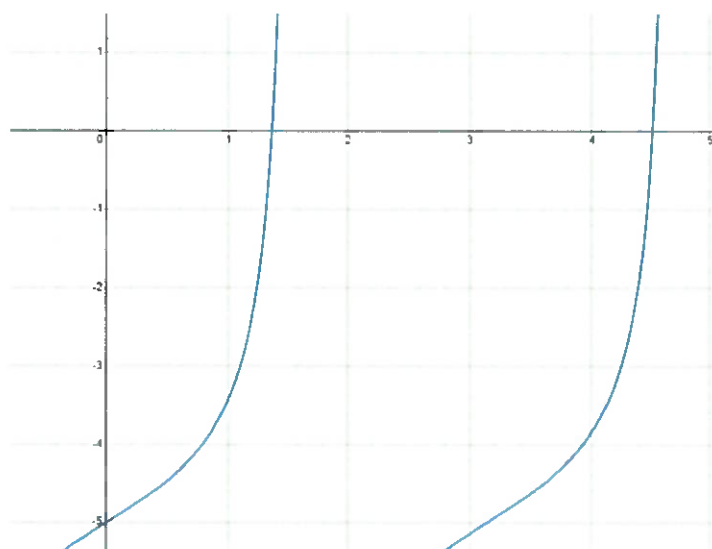
6. a.)  $y = \sin x + 2$



b.)  $y = \cos x + \frac{1}{2}$



c.)  $y = \tan x - 5$



7 Tentukan koordinat titik maksimum, minimum dan titik potong

a.)  $f(x) = 2 \cos(x - \frac{1}{2}\pi)$

$\Rightarrow$  nilai maks = 2

$\Rightarrow$  nilai min = -2

$\Rightarrow 2 = 2 \cos(x - \frac{1}{2}\pi)$

$1 = \cos(x - \frac{1}{2}\pi)$

$\Rightarrow x - \frac{1}{2}\pi = 0$

$x = \frac{\pi}{2}$

$\therefore$  koordinat titik maksimum adalah  $(\frac{\pi}{2}, 2)$

$\Rightarrow -2 = 2 \cos(x - \frac{1}{2}\pi)$

$-1 = \cos(x - \frac{1}{2}\pi)$

$\Rightarrow x - \frac{1}{2}\pi = \pi$

$x = \frac{3\pi}{2}$

$\therefore$  koordinat titik minimum adalah  $(\frac{3\pi}{2}, -2)$

$\Rightarrow$  titik potong sumbu y,  $x=0$

$f(x) = 2 \cos(-\frac{\pi}{2})$

$= 2 \cdot 0$

$= 0$

$\therefore$  titik potong sb. y

di  $(0, 0)$

$\Rightarrow$  titik potong sumbu x,  $y=0$

$0 = 2 \cos(x - \frac{\pi}{2})$

$0 = \cos(x - \frac{\pi}{2})$

$\Rightarrow \frac{\pi}{2} = x - \frac{\pi}{2}$

$\pi = x$

$\Rightarrow \frac{3\pi}{2} = x - \frac{\pi}{2}$

$2\pi = x$

$\therefore$  titik potong sb. x,  $y=0$  di  $(\pi, 0)$  dan  $(2\pi, 0)$

b)  $y = \sin(x - \frac{\pi}{4})$

$\Rightarrow$  nilai maksimum = 1

$\Rightarrow$  nilai minimum = -1

$\Rightarrow 1 = \sin(x - \frac{\pi}{4})$

$\sin \frac{\pi}{2} = \sin(x - \frac{\pi}{4})$

$\frac{\pi}{2} = x - \frac{\pi}{4}$

$\frac{3\pi}{4} = x$

$\therefore$  koordinat titik maksimum adalah  $(\frac{3\pi}{4}, 1)$

$\Rightarrow -1 = \sin(x - \frac{\pi}{4})$

$\sin(\frac{3\pi}{2}) = \sin(x - \frac{\pi}{4})$

$\frac{3\pi}{2} = x - \frac{\pi}{4}$

$\frac{7\pi}{4} = x$

$\therefore$  koordinat titik minimum adalah  $(\frac{7\pi}{4}, -1)$

$\Rightarrow$  titik potong sb. y,  $x=0$

$y = \sin(-\frac{\pi}{4})$

$= -0,707$

$\therefore$  titik potong di  $(0, -0,707)$

$\Rightarrow$  titik potong sb. x,  $y=0$

$0 = \sin(x - \frac{\pi}{4})$

$\Rightarrow \sin 0 = \sin(x - \frac{\pi}{4})$

$0 = x - \frac{\pi}{4}$

$\frac{\pi}{4} = x$

$\Rightarrow \sin \pi = \sin(x - \frac{\pi}{4})$

$\pi = x - \frac{\pi}{4}$

$\frac{5\pi}{4} = x$

$\therefore$  titik potong di  $(\frac{\pi}{4}, 0)$  dan  $(\frac{5\pi}{4}, 0)$

8. a.)  $y = 2 \sin 2(x + \frac{\pi}{4})$

b.)  $y = 2 \sin 3(x + \frac{\pi}{2})$

9. Fungsi  $y = -6 \cos(2x - \frac{\pi}{2}) + 2$

$\Rightarrow y = -6 \cos 2(x - \frac{\pi}{4}) + 2$

a.) amplitudo = 6

b.) periode = 2

c.) nilai min =  $-|a| + d$   
 $= -6 + 2$   
 $= -4$

$\Rightarrow -4 = -6 \cos 2(x - \frac{\pi}{4}) + 2$

$-6 = -6 \cos(2x - \frac{\pi}{2})$

$1 = \cos(2x - \frac{\pi}{2})$

$\Rightarrow \cos 0^\circ = \cos(2x - \frac{\pi}{2})$

$2x - \frac{\pi}{2} = 0$

$2x = \frac{\pi}{2}$

$x = \frac{\pi}{4}$

$\therefore$  koordinat titik minimum adalah  $(\frac{\pi}{4}, -4)$

$\Rightarrow$  nilai maks =  $|a| + d$   
 $= 6 + 2$   
 $= 8$

$\Rightarrow y = -6 \cos(2x - \frac{\pi}{2}) + 2$

$6 = -6 \cos(2x - \frac{\pi}{2})$

$-1 = \cos(2x - \frac{\pi}{2})$

$\Rightarrow \cos \pi = \cos(2x - \frac{\pi}{2})$

$2x - \frac{\pi}{2} = \pi$

$2x = \frac{3\pi}{2}$

$x = \frac{3\pi}{4}$

$\therefore$  koordinat titik maks adalah  $(\frac{3\pi}{4}, 8)$

10.  $f(x) = \sqrt{2} \sin 3x + 1$

a.)  $\Rightarrow$  titik potong sb. y,  $x=0$

$f(x) = \sqrt{2} \sin 0^\circ + 1$   
 $= 1$

$\therefore$  titik nya adalah  $(0, 1)$

$\Rightarrow$  titik potong sb. x,  $y=0$

$0 = \sqrt{2} \sin 3x + 1$

$-1 = \sqrt{2} \sin 3x$

$-\frac{1}{\sqrt{2}} = \sin 3x$

$\Rightarrow \sin 3x = \sin(180^\circ + 45^\circ)$   
 $= \sin 225^\circ$   
 $= \sin \frac{5\pi}{4}$

$\Rightarrow 3x = \frac{5\pi}{4} + k \cdot 2\pi$

$x = \frac{5\pi}{12} + \frac{2}{3}\pi \cdot k$

$\Rightarrow k=0 \rightarrow x = \frac{5\pi}{12}$

$\Rightarrow k=1 \rightarrow x = \frac{13\pi}{12}$

$\Rightarrow k=2 \rightarrow x = \frac{7\pi}{4}$

$\Rightarrow \sin 3x = \sin(360^\circ - 45^\circ)$   
 $= \sin(315^\circ)$   
 $= \sin \frac{7\pi}{4}$

$\Rightarrow 3x = \frac{7\pi}{4} + k \cdot 2\pi$

$x = \frac{7\pi}{12} + \frac{2}{3}\pi \cdot k$

$\Rightarrow k=0 \rightarrow x = \frac{7\pi}{12}$

$\Rightarrow k=1 \rightarrow x = \frac{5\pi}{4}$

$\Rightarrow k=2 \rightarrow x = \frac{23\pi}{12}$

$\therefore$  Titik potongnya adalah  $(\frac{5\pi}{12}, 0), (\frac{13\pi}{12}, 0),$

$(\frac{7\pi}{4}, 0), (\frac{7}{12}\pi, 0), (\frac{5}{4}\pi, 0),$  dan  $(\frac{23\pi}{12}, 0)$

$$b.) f(x) = \sqrt{2} \sin 3x + 1$$

$$\Rightarrow \text{nilai maksimum} = \sqrt{2} + 1 = a$$

$$\Rightarrow \text{nilai minimum} = -\sqrt{2} + 1 = b$$

$$\begin{aligned} \Rightarrow a^2 + b^2 &= (1 + \sqrt{2})^2 + (1 - \sqrt{2})^2 \\ &= (1 + 2\sqrt{2} + 2) + (1 - 2\sqrt{2} - 2) \\ &= 3 + 2\sqrt{2} - 1 - 2\sqrt{2} \\ &= 2 \end{aligned}$$