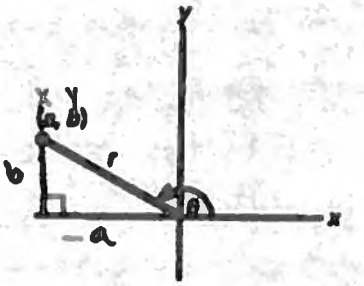
KEY

Trigonometric Functions Section 9.1 Multiple Choice Homework

1. In the figure $r\sin\theta$ equals

(a) a
(b) b
(c) -a
(d) -b
(e) a+b

$r\sin\theta = \cancel{r}\cdot\frac{b}{\cancel{r}} = b$



2. The vertical distance between the minimum and maximum values of the function $y = \left|-\sqrt{2}\sin\sqrt{3}x\right|$ is

Radian mode

(a) 1.414
(b) 2.828
(c) 1.732
(d) 3.464
(e) 2.094

$Y_1 = \text{abs}(-\sqrt{2}\sin\sqrt{3}x)$ ← graph on calc

Min value: $y=0$

Max value: $y=\sqrt{2}\approx 1.414$

3. $\sin^{-1}(\cos 100^\circ) = -10^\circ$

Degree mode in argument but answers in radians... sneaky

(a) 1.0
(b) 1.4
(c) 0.2
(d) -1.4
(e) -0.2

$\frac{-10\pi}{180} \approx -0.175$

not AKC ~~4.~~ The graph of the curve represented by $\left\{\begin{array}{l} x = 3\sin\theta \\ y = 3\sin\theta \end{array}\right\}$ is

(a) a line
(b) a horizontal line segment
(c) a circle
(d) a line segment 3 units long
(e) a line segment with slope 1

$x = y$
but $-3 \le x, y \le 3$

Use parametric mode on your calculator (zoom 4 gives best picture)

not ACC

What is the amplitude of the graph of $y = a\cos x + b\sin x$?

(a) $\frac{a+b}{2}$

(b) $a+b$

(c) $\sqrt{ab}$

(d) $\sqrt{a^2+b^2}$ b/c $\sqrt{2^2+3^2} \approx 3.606$

(e) $(a+b)\sqrt{2}$

$A = \sqrt{a^2+b^2}$ ← formula for amplitude

* use guess + check: let $a=2$ and $b=3$

min @ $y=-3.606$

max @ $y=3.606$

amp $= 3.606$

$\boxed{9\text{-}1}$ Homework: p. 517, #1

* 1. $T = -40 + 70\sin\left[\frac{\pi}{7}(x-5)\right]$

d) $-10 = -40 + 70\sin\left[\frac{\pi}{7}(x-5)\right]$

$\sin^{-1}\left(\frac{30}{70}\right) = \frac{\pi}{7}(x-5)$

$\frac{\pi}{7}(x-5) = \begin{cases} 0.443 \pm 2\pi n \\ 2.699 \pm 2\pi n \end{cases}$

$x-5 = \begin{cases} 0.989 \pm 14n \\ 6.013 \pm 14n \end{cases}$

$x = \begin{cases} 5.989 \pm 14n \\ 11.013 \pm 14n \end{cases}$

$x = 5.989, 11.013$ hrs. $\therefore$ $\boxed{\text{True}}$ or look @ graph from calc

a) look @ amplitude of graph: $A = 70$
sinusoidal axis @ $y = -40$
min value $= -110°$
max value $= 30° \therefore$ $\boxed{\text{True}}$

b) period $= \frac{2\pi}{\pi/7} = 14 \therefore$ $\boxed{\text{False}}$

c) $T(0) \approx -94.728° \therefore$ $\boxed{\text{False}}$ b/c min $= -110°$

$\boxed{9\text{-}1}$ Homework: p. 517, #2-15

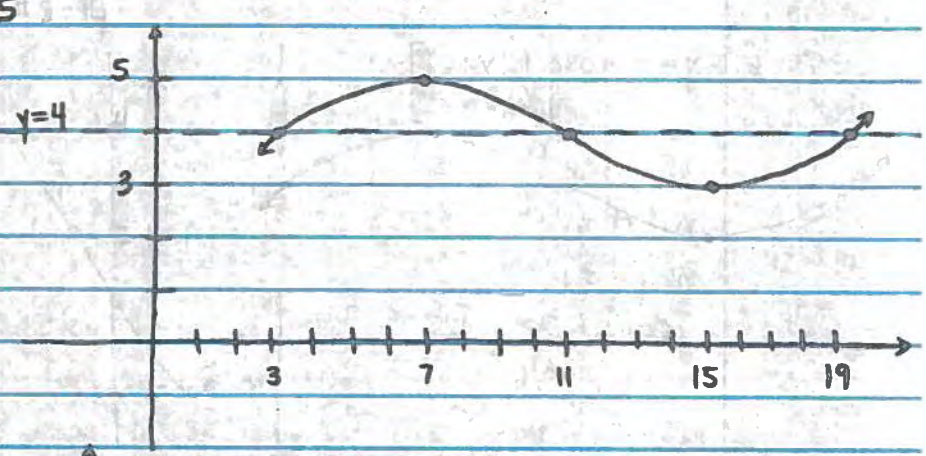
2. $y = 4 + 1\sin\left[\frac{\pi}{8}(x-3)\right]$

VS ↑4 @ $y=4$

amp = 1

period $= \frac{2\pi}{\pi/8} = 16$

PS → 3



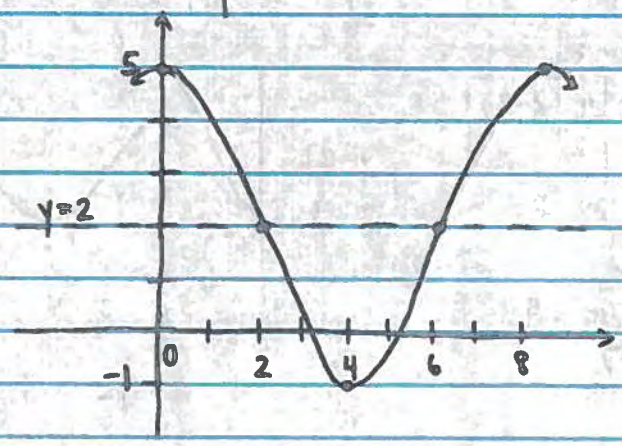
3. $y = 2 + 3\cos\left[\frac{\pi}{4}(x)\right]$

VS ↑2 @ $y=2$

amp = 3

period $= \frac{2\pi}{\pi/4} = 8$

PS: none



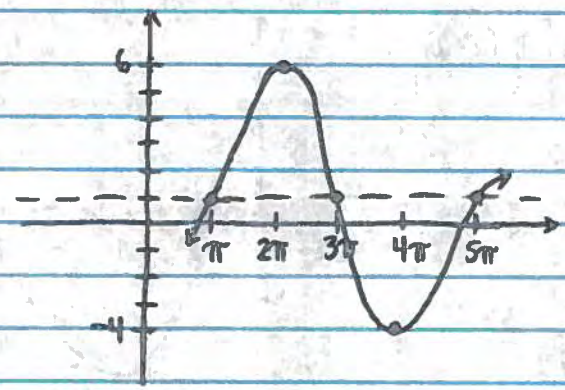
* 4. $y = 1 + 5\sin\left[\frac{1}{2}(x-\pi)\right]$

VS ↑1 @ $y=1$

amp = 5

period $= \frac{2\pi}{1/2} = 4\pi$

PS → π



* 5. $y = 1 - 3\sin[\pi(x)]$

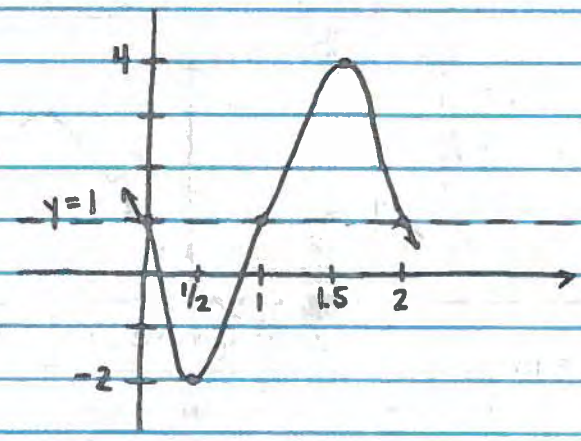
VS ↑1 @ $y=1$

amp = 3

reflection

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

PS: none



* 6. $y = -3\cos\left[\frac{\pi}{6}(x+2)\right]$

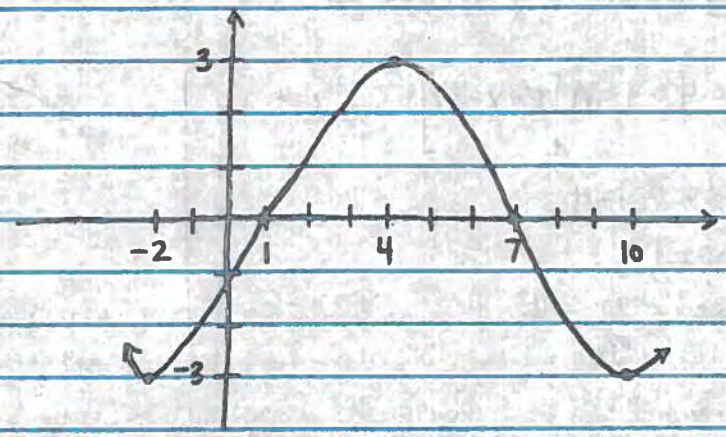
VS: none

reflection

amp = 3

period $= \frac{2\pi}{\pi/6} = 12$

PS ← 2



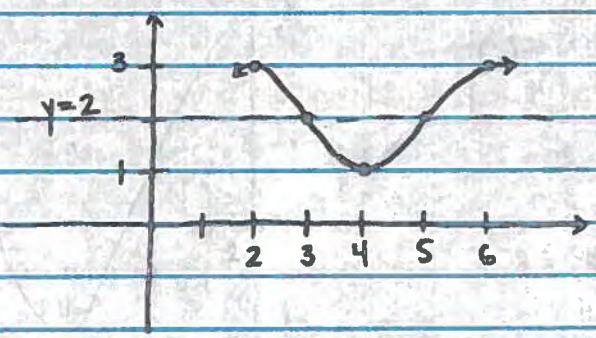
7. $y = 2 + \cos\left[\frac{\pi}{2}(x-2)\right]$

VS ↑ 2 @ y = 2

amp = 1

period $= \frac{2\pi}{\pi/2} = 4$

PS → 2



8. $y = -2 - 4\sin\left[\frac{\pi}{5}(x-2)\right]$

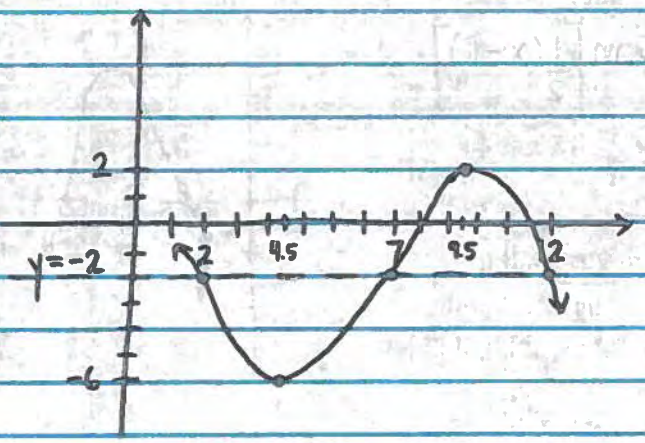
VS ↓ 2 @ y = -2

reflection

amp = 4

period $= \frac{2\pi}{\pi/5} = 10$

PS → 2



* 9. $y = 2 - 2\cos\left[\frac{1}{2}\left(x + \frac{\pi}{2}\right)\right]$

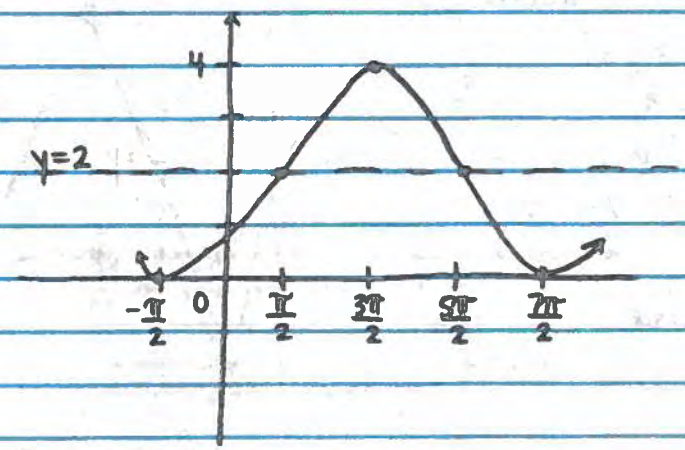
VS ↑ 2 @ y = 2

reflection

amp = 2

period $= \frac{2\pi}{1/2} = 4\pi$

PS ← $\frac{\pi}{2}$



* 10. $y = k + A\cos[B(x-h)]$

vertical shift $\uparrow 2 \therefore k=2$

horizontal shift $\leftarrow 4 \therefore h=-4$

period $= 8 \therefore \frac{2\pi}{B} = 8$; $B = \frac{\pi}{4}$

amplitude $(A) = 3$

$y = 2 + 3\cos\frac{\pi}{4}(x+4)$

$y = k + A\sin[B(x-h)]$

amplitude $(A) = 3$

vertical shift $\uparrow 2 \therefore k=2$

horizontal shift $\rightarrow 1 \therefore h=1$

period $= 8 \therefore B = \frac{\pi}{4}$

$y = 2 + 3\sin\frac{\pi}{4}(x-1)$

* 11. $y = k + A\sin[B(x-h)]$

amp$(A) = 1$

VS $\uparrow 2 \therefore k=2$

HS $\rightarrow \pi \therefore h=\pi$

period $= 8\pi \therefore \frac{2\pi}{B} = 8\pi$; $B = \frac{1}{4}$

$y = 2 + \sin\left[\frac{1}{4}(x-\pi)\right]$

$y = k + A\cos[B(x-h)]$

VS $\uparrow 2 \therefore k=2$

amp$(A) = 1$

PS $\leftarrow 5\pi \therefore h=-5\pi$

period $= 8\pi \therefore \frac{2\pi}{B} = 8\pi \therefore B = \frac{1}{4}$

$y = 2 + \cos\left[\frac{1}{4}(x+5\pi)\right]$

12. $y = k + A\cos[B(x-h)]$

no VS $\therefore k=0$

amp$(A) = 4$

PS $\leftarrow 1 \therefore h=-1$

period: $4 = \frac{2\pi}{B}$; $B = \frac{\pi}{2}$

$y = 4\cos\left[\frac{\pi}{2}(x+1)\right]$

$y = k + A\sin[B(x-h)]$

no VS $\therefore k=0$

amp$(A) = 4$

PS $\rightarrow 2 \therefore h=2$

period: $4 = \frac{2\pi}{B}$; $B = \frac{\pi}{2}$

$y = 4\sin\left[\frac{\pi}{2}(x-2)\right]$

(in class) 13. VS $\downarrow 2 \therefore k=-2$

amp$(A) = 4$

PS $\leftarrow \pi \therefore h=-\pi$

period: $3\pi = \frac{2\pi}{B}$; $B = \frac{2}{3}$

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

VS $\downarrow 2 \therefore k=-2$

amp$(A) = 4$

period $= 3\pi \therefore B = \frac{2}{3}$

PS $\rightarrow 1\frac{1}{3} = \frac{4}{3}$

$y = -2 + 4\sin\left[\frac{2}{3}\left(x - \frac{4}{3}\right)\right]$

14. VS ↓2 ∴ $k=-2$

amp(A) = 2

sin: PS → 1/4 ∴ $h = 1/4$ cos: PS → 1/2 ∴

period : $1 = \frac{2\pi}{B}$; $B = 2\pi$

$$y = -2 + 2\sin\left[2\pi\left(x - \frac{1}{4}\right)\right]$$

$$y = -2 + 2\cos\left[2\pi\left(x - \frac{1}{2}\right)\right]$$

15. VS ↓2 ∴ $k=-2$

amp(A) = 1

cos : PS ← 8 sin : PS ← 4.5

period: $14 = \frac{2\pi}{B}$; $B = \frac{\pi}{7}$

$$y = -2 - \sin\left[\frac{\pi}{7}(x + 4.5)\right]$$

$$y = -2 + \cos\left[\frac{\pi}{7}(x - 8)\right]$$

KEY

Trigonometric Functions Section 9.2 Multiple Choice Homework

value x when y=0 — radian mode

1. What is the smallest positive x - intercept of the graph of $y = 3\sin 2\left(x + \frac{2\pi}{3}\right)$?

$3\sin 2\left(x+\frac{2\pi}{3}\right)=0$

$\sin\left(2x+\frac{4\pi}{3}\right)=0$

$2x+\frac{4\pi}{3}=\sin^{-1}(0)$

$2x=\left\{\begin{matrix}-\frac{4\pi}{3}\\ 0\end{matrix}\right.\pm\pi n$

$x=\left\{\begin{matrix}-\frac{2\pi}{3}\\ 0\end{matrix}\right.\pm\frac{\pi}{2}n$

$x=-2.094,\ -.524,\ 1.047$

(a) 0
(b) 2.09
(c) 1.05
(d) 0.52
(e) 1.31

2. The smallest positive value of x satisfying the equation $\tan 5x = -2$ is closest to

$5x=\tan^{-1}(-2)$

$5x=\left\{\begin{matrix}-63.435^\circ\\ 0\end{matrix}\right.\pm 180^\circ n$

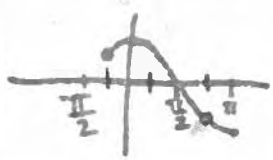
$x=\left\{\begin{matrix}-12.687^\circ\\ 0\end{matrix}\right.\pm 36^\circ n$

$x=-12.687^\circ,\ 23.313^\circ$

degree mode

(a) 13°
(b) 31°
(c) 23°
(d) 49°
(e) 63°

3. As x increases from $-\frac{\pi}{4}$ to $\frac{3\pi}{4}$, the value of $\cos x$



(a) always increases
(b) always decreases
(c) increases then decreases
(d) decreases then increases
(e) does none of the above

not ACC ~~4.~~ The graph of the curve represented by $\left\{\begin{matrix} x=\sec\theta \\ y=\cos\theta \end{matrix}\right\}$ is

$y=\frac{1}{x} \Rightarrow$ hyperbola

but $-1\le y\le 1$, $x\ge 1$ or $x\le -1$

(a) a line
(b) a hyperbola
(c) an ellipse
(d) a line segment
(e) a portion of a hyperbola

Use parametric mode on your calculator.

5. The figure below shows the graph of $y = \sin 3x$. What is the value of x at point P?

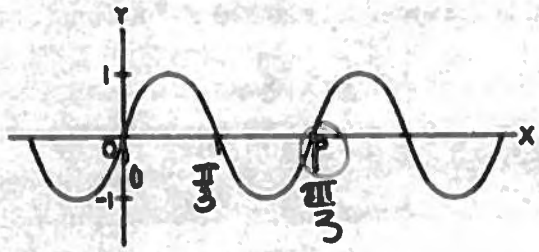
(a) $\frac{\pi}{3}$

(b) $\frac{2\pi}{3}$

(c) 2π

(d) 3π

(e) 6π



$\sin 3x = 0$

$3x = \{0 \pm \pi n$

$x = \{0 \pm \frac{\pi}{3} n$

$x = 0, \frac{\pi}{3}, \frac{2\pi}{3}$

$\boxed{9\text{-}2}$ Homework: p. 525, #1-8

1. $y = 2 + 3\cos\left[\frac{\pi}{4}(x)\right]$

a) $y(-2.7) \approx 0.433$

b) $0 = 2 + 3\cos\left(\frac{\pi}{4}x\right)$

$\cos^{-1}\left(\frac{-2}{3}\right) = \frac{\pi}{4}x$

$\frac{\pi}{4}x = \pm 2.301 \pm 2\pi n$

$x = \pm 2.929 \pm 8n$

$x \in \{2.929, 5.071, 10.929\}$

2. $y = 4 - \cos\left[\frac{\pi}{4}(x-12)\right]$

a) $y(-2.7) \approx 3.478$

b) $0 = 4 - \cos\left[\frac{\pi}{4}(x-12)\right]$

$\underset{\text{DNE}}{\cancel{\cos^{-1}(4)}} = \frac{\pi}{4}(x-12)$

$x =$ no solutions

3. $y = 1 + 5\sin\left[\frac{1}{2}(x-\pi)\right]$

a) $y(-2.7) \approx -0.095$

b) $0 = 1 + 5\sin\left[\frac{1}{2}(x-\pi)\right]$

$\sin^{-1}\left(\frac{-1}{5}\right) = \frac{1}{2}(x-\pi)$

$\frac{1}{2}(x-\pi) = \begin{cases} -0.201 \pm 2\pi n \\ 3.343 \pm 2\pi n \end{cases}$

$x - \pi = \begin{cases} -0.403 \pm 4\pi n \\ 6.686 \pm 4\pi n \end{cases}$

$x = \begin{cases} 2.739 \pm 4\pi n \\ 9.827 \pm 4\pi n \end{cases}$ $\therefore x \in \{2.739, 9.827, 15.305\}$

4. $y = 3 + 7\cos\left[\frac{1}{3}\left(x - \frac{\pi}{2}\right)\right]$

a) $y(-2.7) \approx 4.027$

b) $0 = 3 + 7\cos\left[\frac{1}{3}\left(x - \frac{\pi}{2}\right)\right]$

$\cos^{-1}\left(\frac{-3}{7}\right) = \frac{1}{3}\left(x - \frac{\pi}{2}\right)$

$\frac{1}{3}\left(x - \frac{\pi}{2}\right) = \begin{cases} 2.014 \pm 2\pi n \\ -2.014 \pm 2\pi n \end{cases}$

$x - \frac{\pi}{2} = \begin{cases} 6.041 \pm 6\pi n \\ -6.041 \pm 6\pi n \end{cases}$

$x = \begin{cases} 7.612 \pm 6\pi n \\ -4.470 \pm 6\pi n \end{cases}$

$x \in \{7.612, 14.379, 26.462\}$

5. $y = -3\cos\left[\frac{\pi}{6}(x+21)\right]$

a) $y(4.8) = -1.763$

b) $0 = -3\cos\left[\frac{\pi}{6}(x+21)\right]$

$\cos^{-1}(0) = \frac{\pi}{6}(x+21)$

$\frac{\pi}{6}(x+21) = \begin{cases} \pm\frac{\pi}{2} \pm 2\pi n \end{cases}$

$x + 21 = \{\pm 3 \pm 12n$

$x = \begin{cases} -18 \pm 12n \\ -24 \pm 12n \end{cases}$

$x \in \{-24, -18, -12, -6\}$

6. $y = 2 + \cos\left[\frac{\pi}{2}(x-5)\right]$

a) $y(4.8) \approx 2.951$

b) $0 = 2 + \cos\left[\frac{\pi}{2}(x-5)\right]$

$\underset{\text{DNE}}{\cancel{\cos^{-1}(-2)}} = \frac{\pi}{2}(x-5)$

$x =$ no solutions

7. $y = 0.7 + \sin\left[\frac{\pi}{8}(x-3)\right]$

a) $y(4.8) = 1.349$

b) $0 = 0.7 + 1\sin\left[\frac{\pi}{8}(x-3)\right]$

$\sin^{-1}(-0.7) =$

$-0.775 \pm 2\pi n = \frac{\pi}{8}(x-3)$

$2.366 \pm 2\pi n$

$x = -3.025, -14.975, -19.025$

8. $y = 1 - 3\sin[\pi(x)]$

a) $y(4.8) \approx -0.763$

b) $0 = 1 - 3\sin(\pi x)$

$\sin^{-1}\left(\frac{1}{3}\right) = \pi x$

$\pi x = \begin{cases} 0.340 \pm 2\pi n \\ 2.802 \pm 2\pi n \end{cases}$

$x = \begin{cases} 0.108 \pm 2n \\ 0.892 \pm 2n \end{cases}$

$x \in \{-1.108, -1.892, -3.108, -3.892\}$