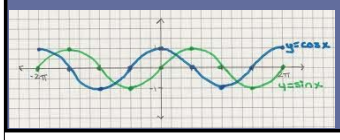
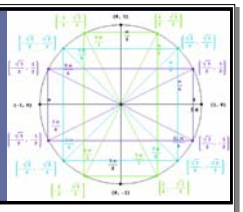
Unit 4: Trigonometry





4.7 Writing Sinusoidal Equations

Determine a, b, c, d from the graph and sub into the equation on the formula sheet.

Recall: $y = a\sin[\, b(x-c)\,] + d$ & $y = a\cos[\, b(x-c)\,] + d$

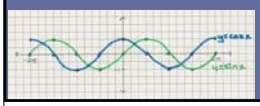
a: amplitude

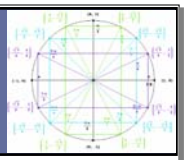
b: HS of $1/b$ → Period $= \frac{360^\circ}{b}$ Period $= \frac{2\pi}{b}$

c: phase shift (opposite direction of sign)

d: median < max: $d+a$ / min: $d-a$

Worksheet



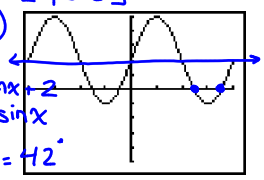


a) $y = 3\sin x + 2$

median: $d=2$
$y=2$

amplitude: $a=3$
max: 5
min: -1
range: $[-1, 5]$
phase shift: $c=0$
period: 360° or 2π
y-int: $(0,2)$
x-int: $(222^\circ, 0), (318^\circ, 0)$
$[0, 360^\circ]$

a)



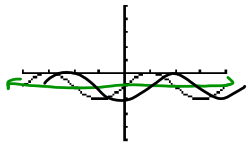
$0 = 3\sin x + 2$
$-\frac{2}{3} = \sin x$
$\theta_{ref} = 42^\circ$
S A
T C
$222^\circ, 318^\circ$

b) $y = -\cos(x+90^\circ) - 1$

median: $d=-1$ $\left(y = -\cos\left(x+\frac{\pi}{2}\right)-1\right)$
$y=-1$

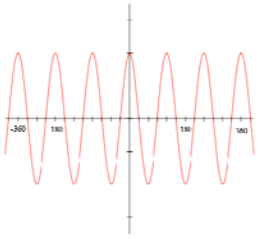
amp: $a=1$
max: 0
min: -2
range: $[-2, 0]$
phase shift: $c = 90^\circ$ left
Period: 360° or 2π

b)



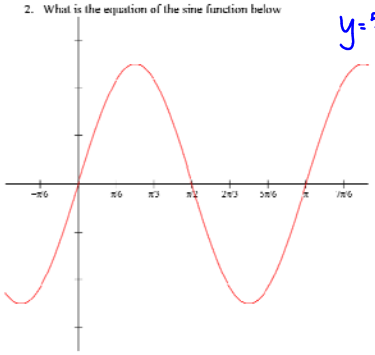
Pre-Calculus 30
Determining an equation from a graph.

1. What is the equation of the cosine function below?



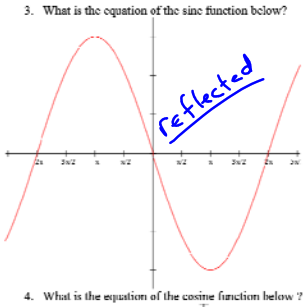
$y = 2\cos(3x)$

2. What is the equation of the sine function below



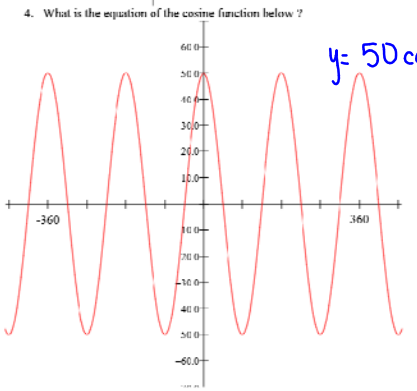
$y = \frac{5}{2}\sin(2x)$

3. What is the equation of the sine function below?



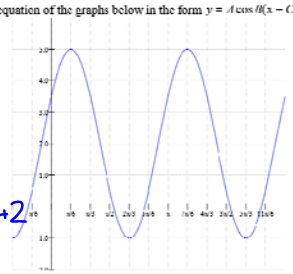
$y = -3\sin(\frac{1}{2}x)$

4. What is the equation of the cosine function below ?

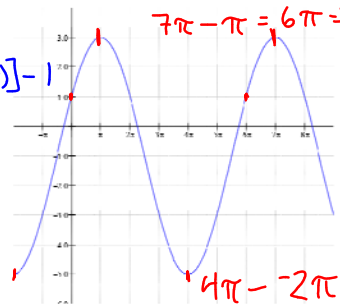


$y = 50\cos(2x)$

5. Determine the equation of the graphs below in the form $y = A\cos B(x - C) + D$



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



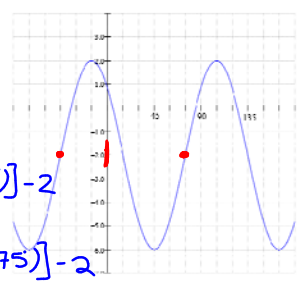
$7\pi - \pi = 6\pi = P$

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

$4\pi - {}^{-}2\pi$

6. Determine the equation of the graphs below in the form $y = A\sin B(x - C) + D$

a)

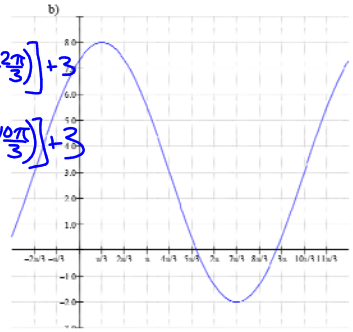


$y = 4\sin[3(x + 45)] - 2$

OR

$y = 4\sin[3(x - 75)] - 2$

b)

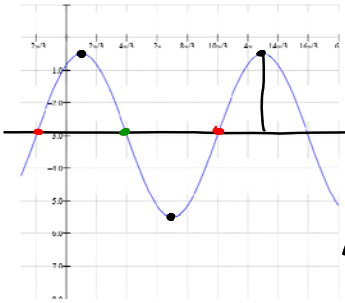


$y = 5\sin\left[\frac{1}{2}\left(x + \frac{2\pi}{3}\right)\right] + 3$

OR

$y = 5\sin\left[\frac{1}{2}\left(x - \frac{10\pi}{3}\right)\right] + 3$

7. Determine the equation of the graphs below in the forms
$y = A\cos B(x - C) + D$ $y = A\sin B(x - C) + D$



cosine
$C = \frac{\pi}{3}$ right

sine
$\frac{10\pi}{3}$ right
$\frac{2\pi}{3}$ left

$d = -3$
$a = 2.5$
$P = \frac{2\pi}{b}$
$4\pi = \frac{2\pi}{b}$
$b = \frac{2\pi}{4\pi} = \frac{1}{2}$

$y = 2.5\cos[\frac{1}{2}(x - \frac{\pi}{3})] - 3$
$y = 2.5\sin[\frac{1}{2}(x + \frac{2\pi}{3})] - 3$
$y = 2.5\sin[\frac{1}{2}(x - \frac{10\pi}{3})] - 3$

8. A sine function is given by the equation $y = 3\sin 2\left(x - \frac{\pi}{4}\right) + 2$. Determine the

a) Amplitude 3
b) Period π
c) phase shift $\pi/4$ right
d) vertical displacement 2 up
e) y-intercept $(0, -1)$
f) Domain $(-\infty, \infty)$
g) Range $[-1, 5]$
h) Sketch

9. Consider the equation $y = 4\cos(x - \frac{\pi}{3}) + 2$. Determine the

a) Amplitude 4
b) Period 2π
c) phase shift $\pi/3$ right
d) vertical displacement 2 up
e) y-intercept $(0, 4)$
f) Domain $x \in \mathbb{R}$
g) Range $[-2, 6]$
h) Sketch