8.3
Notes

GRAPHS OF Y=ASIN(BX−C) AND Y=ACOS(BX−C)

OBJECTIVES: 1) Graph functions of the form $y = A\sin(Bx - C) + D$ and $y = A\cos(Bx - C) + D$

2) Determine the amplitude, period, and phase shift of a sin/cos function.

$y = A\sin(Bx - C) + D$ $\qquad$ $y = A\cos(Bx - C) + D$

AMPLITUDE: |A| is the **Amplitude** (Total height = 2A). If A is negative flip across the x-axis.

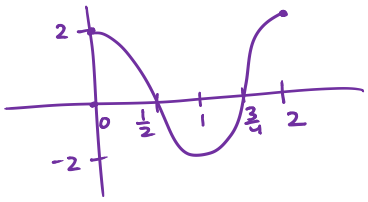
PHASE SHIFT: $(Bx - C)$ determines the **phase shift** that will shift our graph horizontally.

VERTICAL SHIFT: $+D$ results in a vertical shift $\qquad$ **MIDLINE/AXIS OF EQUILIBRIUM**

1) Sketch the graph of $y = 2\cos(\pi x)$

$0 \le \pi x \le 2\pi$

$0 \le x \le 2$



2) Sketch the graph of $y = -4\sin\left(\frac{3}{2}x + \frac{\pi}{2}\right)$

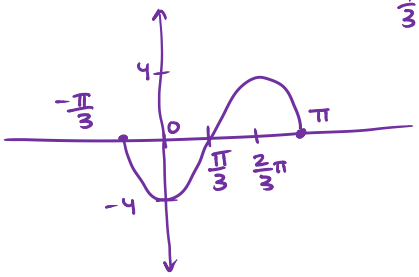
$0 \le \frac{3}{2}x + \frac{\pi}{2} \le 2\pi$

$-\frac{\pi}{2} \le \frac{3}{2}x \le \frac{3}{2}\pi$

$-\frac{\pi}{3} \le x \le \pi$

$\frac{4}{3}\pi \div 2$

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

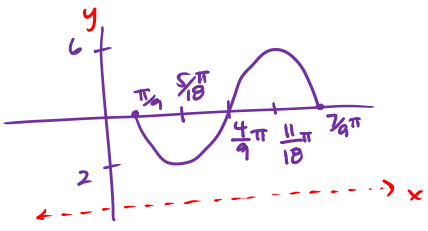


3) Sketch the graph of $y = -2\sin\left(3x - \frac{\pi}{3}\right) + 4$

$0 \le 3x - \frac{\pi}{3} \le 2\pi$

$\frac{\pi}{3} \le 3x \le \frac{7}{3}\pi$

$\frac{\pi}{9} \le x \le \frac{7}{9}\pi$

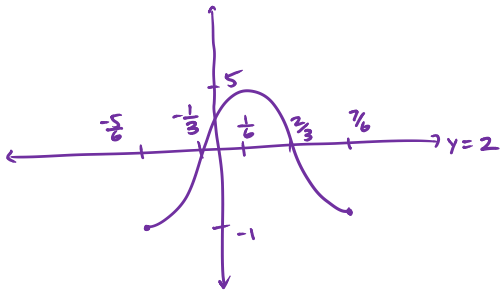


4) Sketch the graph of $y = 2 - 3\cos\left(\pi x + \frac{5\pi}{6}\right)$

$0 \le \pi x + \frac{5}{6}\pi \le 2\pi$

$-\frac{5}{6}\pi \le \pi x \le \frac{7}{6}\pi$

$-\frac{5}{6} \le x \le \frac{7}{6}$

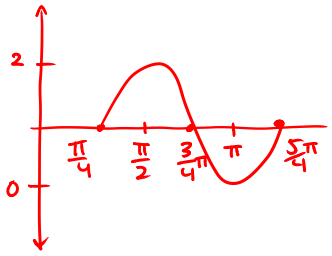


5) Sketch the graph of $y = \sin\left(2x - \frac{\pi}{2}\right) + 1$

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

$\frac{\pi}{2} \le 2x \le \frac{5}{2}\pi$

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

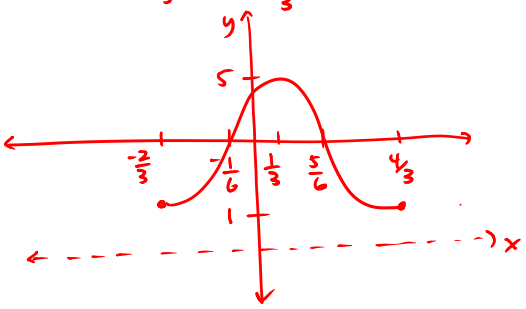


6) Sketch the graph of $y = -2\cos\left(\pi x + \frac{2\pi}{3}\right) + 3$

$0 \le \pi x + \frac{2\pi}{3} \le 2\pi$

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

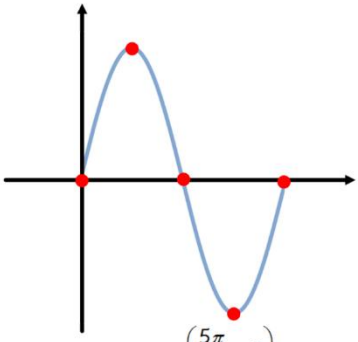
$-\frac{2}{3} \le x \le \frac{4}{3}$



WRITING THE EQUATION FROM A GRAPH!

Write the equation of the sine function shown below.

7.



Amp. is 3 $\left(\frac{5\pi}{4}, -3\right)$

$y = A\sin(Bx - C) + D$ ← no shift vertically

$y = 3\sin(Bx - C)$

$\frac{5}{4}\pi = \frac{3}{4}P$ $\frac{5}{4}\pi$ marks $\frac{3}{4}$ of the period

$P = \frac{5}{3}\pi$ so, $0 \le x \le \frac{5}{3}\pi$ Transform into $0 \le Bx - C \le 2\pi$

$\left(0 \le x \le \frac{5}{3}\pi\right)\frac{6}{5}$ ← needs to become 2π

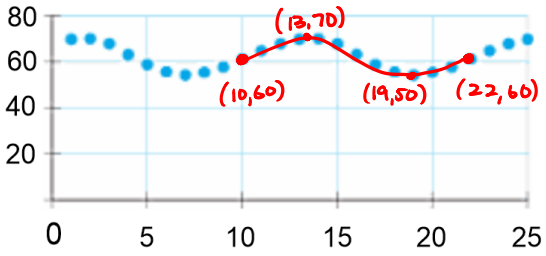
$\frac{5}{3}\pi \cdot z = 2\pi$

$0 \le \frac{6}{5}x \le 2\pi$

$z = \frac{6}{5}$ Now multiply by $\frac{6}{5}$

$\therefore \boxed{y = 3\sin\left(\frac{6}{5}x\right)}$

8.



looks like Amplitude is 10

$y = A\sin(Bx - C) + D$

$10 \le x \le 22$ ← Transform into

$-10 \quad -10 \quad -10$

$0 \le x - 10 \le 12$ $0 \le Bx - C \le 2\pi$

need 12 to become 2π

$(0 \le x - 10 \le 12)\frac{\pi}{6}$ $12z = 2\pi$

$0 \le \frac{\pi}{6}x - \frac{5}{3}\pi \le 2\pi$ $z = \frac{1}{6}\pi$

Now multiply by $\frac{\pi}{6}$

$\therefore \boxed{y = 10\sin\left(\frac{\pi}{6}x - \frac{5}{3}\pi\right) + 60}$