

§1.5 (part 2): Graphs of Sine & Cosine

1.] Sketch the graph of $f(x) = -4 \sin(x + \frac{\pi}{4})$

$a = -4$

$b = 1$

$c = -\pi/4$

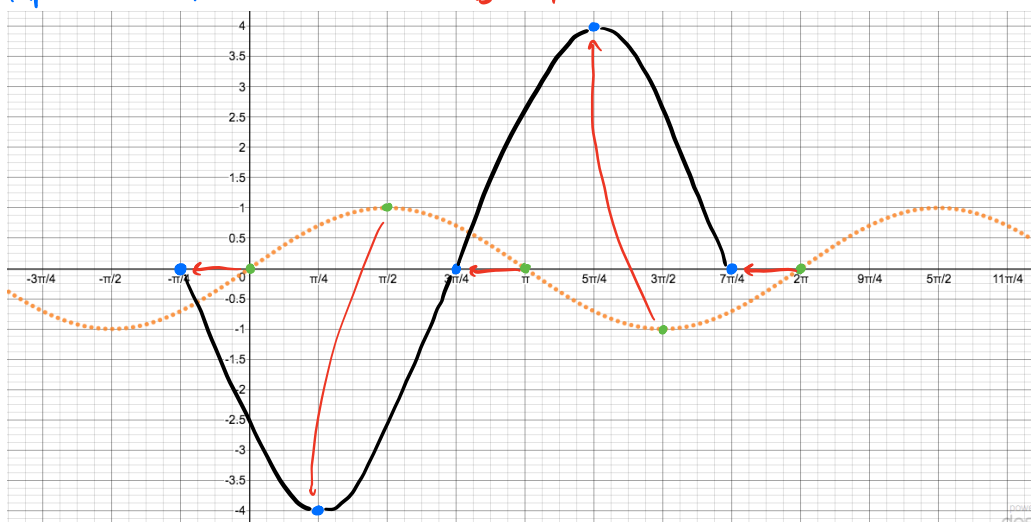
$d = 0$

Amplitude = $|a| = |-4| = 4$

Period = $\frac{2\pi}{b} = \frac{2\pi}{1} = 2\pi$

Phase Shift: Left shift

As Vertical Shift



Fundamental Cycle \rightarrow Starts at $x = \frac{c}{b} = \frac{-\pi/4}{1} = -\frac{\pi}{4} \rightarrow$ First key Point: $(-\frac{\pi}{4}, 0)$

\hookrightarrow Ends at $x = \frac{2\pi + c}{b} = \frac{2\pi + (-\pi/4)}{1} = \frac{8\pi}{4} - \frac{\pi}{4} = \frac{7\pi}{4} \rightarrow$ Last key Point: $(\frac{7\pi}{4}, 0)$

2.] Sketch the graph of $f(x) = \frac{2}{3} \cos(\frac{x}{2} - \frac{\pi}{4})$

$a = \frac{2}{3}$

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

$c = \pi/4$

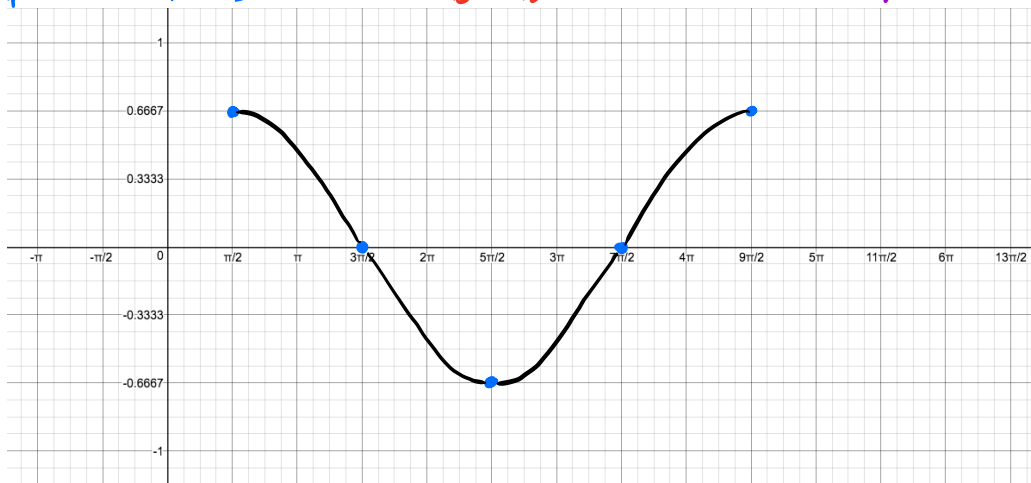
$d = 0$

Amplitude = $|a| = |\frac{2}{3}| = \frac{2}{3}$

Period = $\frac{2\pi}{b} = \frac{2\pi}{1/2} = 4\pi$

Phase Shift: Right shift

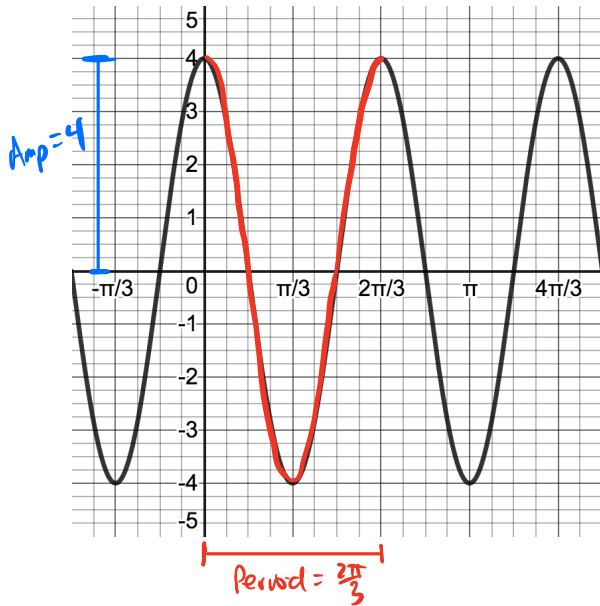
As Vertical Shift



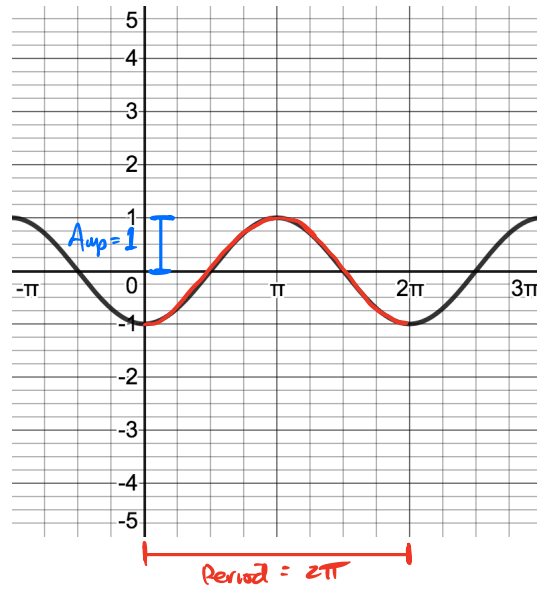
Fundamental Cycle \rightarrow Starts at $x = \frac{c}{b} = \frac{\pi/4}{1/2} = \frac{\pi}{2} \rightarrow$ First key Point: $(\frac{\pi}{2}, \frac{2}{3})$

\hookrightarrow Ends at $x = \frac{2\pi + c}{b} = \frac{2\pi + (\pi/4)}{1/2} = \frac{9\pi/4}{1/2} = \frac{9\pi}{2} \rightarrow$ Last key Point: $(\frac{9\pi}{2}, \frac{2}{3})$

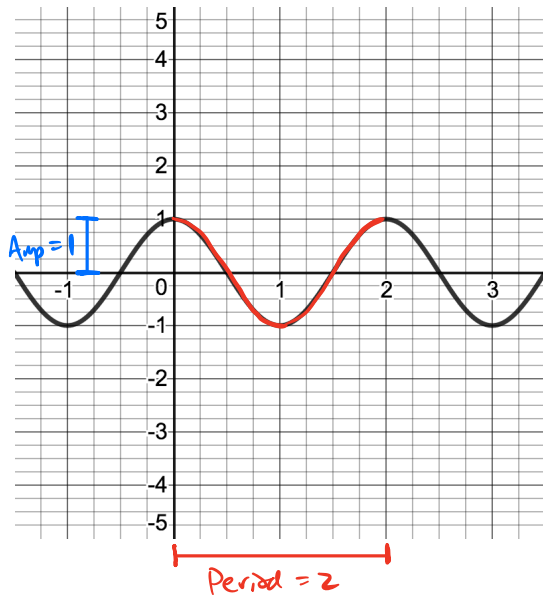
3.] For each graph below, write the equation of the function.



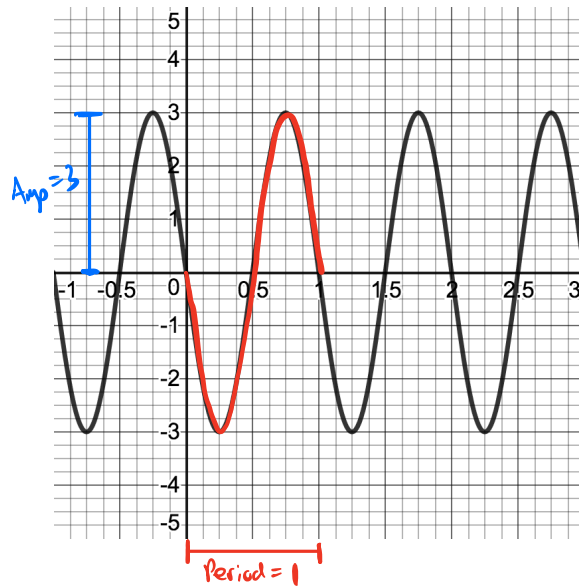
$a=4, b=3, c=0, d=0$, sine
 \Rightarrow $f(x) = 4 \sin(3x)$



$a=-1, b=1, c=0, d=0$, cosine (flipped)
 $f(x) = -\cos(x)$ or $f(x) = \sin(x - \pi/2)$



$a=1, b=\pi, c=0, d=0$, cosine
 $f(x) = \cos(\pi x)$



$a=-3, b=2\pi, c=0, d=0$, sine (flipped)
 $f(x) = -3 \sin(2\pi x)$