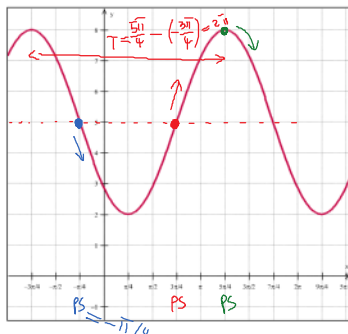


6.6 Modeling with Trigonometric Functions

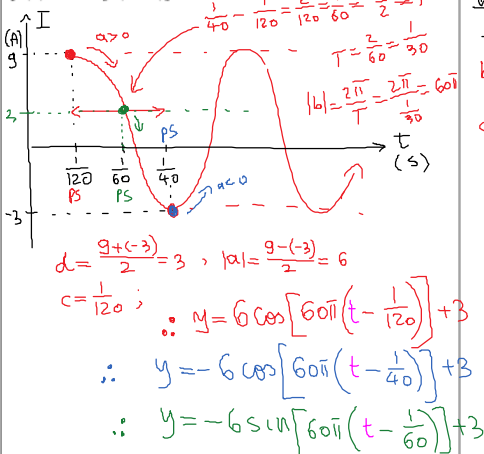
Ex 1. Find the equation (in the form $y = a \sin[b(x-c)] + d$) of the trigonometric function represented graphically to the right.

$y_{\max} = 8$
 $y_{\min} = 2$
 $y_{\text{axis}} = \frac{y_{\max} + y_{\min}}{2} = \frac{8+2}{2} = 5 = d$
 $A = \frac{y_{\max} - y_{\min}}{2} = \frac{8-2}{2} = 3 = |a|$
 $PS = \frac{2\pi}{4} = c$
 $T = \frac{2\pi}{|b|} \Rightarrow |b| = \frac{2\pi}{T} = \frac{2\pi}{2\pi} = 1$
 $|b| = 1$
 $\therefore y = 3 \sin(x - \frac{2\pi}{4}) + 5$
 $\therefore y = -3 \sin(x + \frac{\pi}{4}) + 5$
 $\therefore y = 3 \cos(x - \frac{5\pi}{4}) + 5$

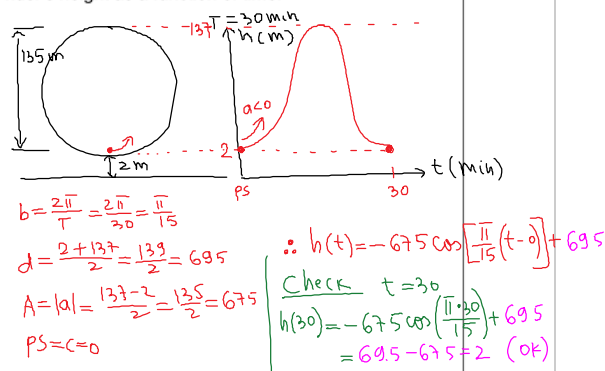


Ex 2. An oscilloscope hooked up to an alternating current (AC) circuit shows a sine curve. The device records the current in amperes (A) on the vertical axis and the time in seconds on the horizontal axis. At $t = \frac{1}{120}$ s, the current reads its first maximum value of 9 A.

9 A. At $t = \frac{1}{40}$ s, the current reads its first minimum value of -3 A. Determine the equation of the function that express the current in terms of time in the form $f(x) = a \cos[b(x-c)] + d$.

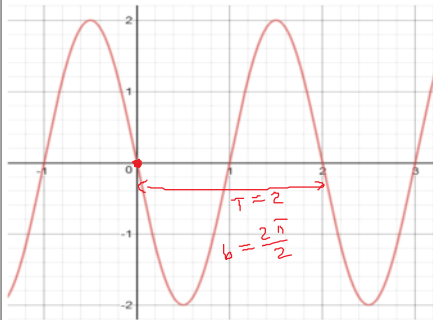


Ex 3. London Eye is a huge Ferris wheel with diameter 135 meters (443 feet) in London, England, which completes one rotation every 30 minutes. Riders board from a platform 2 meters above the ground. Express a rider's height as a function of time.



Ex 4. For each case, find the equation of the trigonometric function in the form $f(x) = a \sin[b(x-c)] + d$.

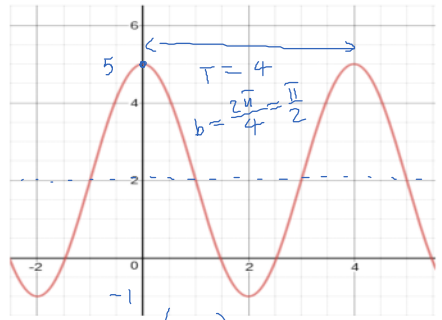
a)



$$y = -2 \sin(\pi x)$$

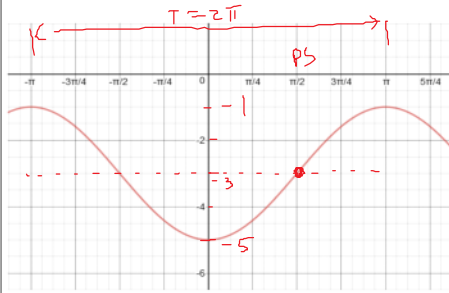
Ex 5. For each case, find the equation of the trigonometric function in the form $f(x) = a \cos[b(x-c)] + d$.

a)



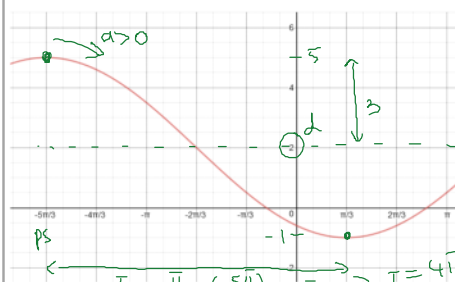
$$y = 3 \cos\left(\frac{\pi}{2}x\right) + 2$$

b)



$$y = 2 \sin\left(x - \frac{\pi}{2}\right) - 3$$

b)



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

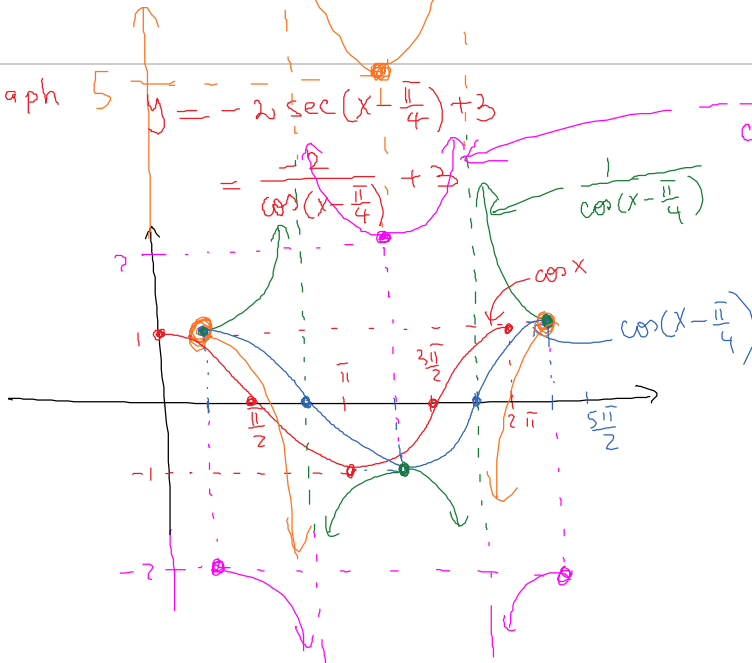
$$= -3 \cos\left[\frac{1}{2}\left(x - \frac{\pi}{3}\right)\right] + 2$$

Reading: Nelson Textbook, Pages 354-360
Homework: Nelson Textbook, Page 360: #1, 6, 9, 13

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

Ex. Graph 5



$$R: (-\infty, 1] \cup [5, \infty)$$