Graphing Sine and Cosine with Phase Shift

What about phase shift (Horizontal Shifting)?

$$y = asin[k(x-b)]$$
$$y = a\cos[k(x-b)]$$
$$k > 0$$

Amp $= |a|$ and Period $p = \frac{2\pi}{k}$

Interval of One Cycle $=[b, b+p]$

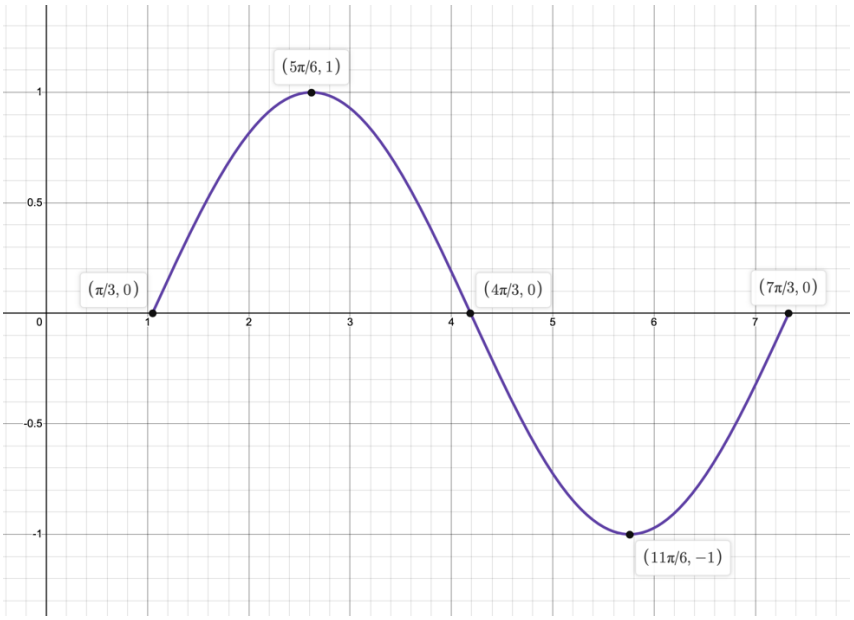
Phase Shift b

Determine the amplitude, period, interval of one cycle, phase shift, x-intercepts, max value, min value, and use this information to sketch the curve.

1. $y = sin\left(x - \frac{\pi}{3}\right)$
2. $y = \sin\left(x - \frac{\pi}{4}\right)$
3. $y = \cos\left(x + \frac{\pi}{3}\right)$
4. $y = \cos\left(x + \frac{\pi}{4}\right)$
5. $y = sin\left[2\left(x + \frac{\pi}{2}\right)\right]$
6. $y = sin\left[3\left(x - \frac{\pi}{4}\right)\right]$
7. $y = 3cos[2(x-\pi)]$
8. $y = 2cos[4(x-\pi)]$
9. $y = \frac{3}{2}sin\left[4\left(x + \frac{\pi}{3}\right)\right]$
10. $y = 5sin\left[2\left(x + \frac{\pi}{6}\right)\right]$
11. $y = -\cos\left[2x - \frac{\pi}{3}\right]$
12. $y = -cos\left[2x - \frac{\pi}{4}\right]$
13. $y = -5sin\left[3x + \frac{\pi}{2}\right]$
14. $y = -4sin\left[3x + \frac{\pi}{6}\right]$

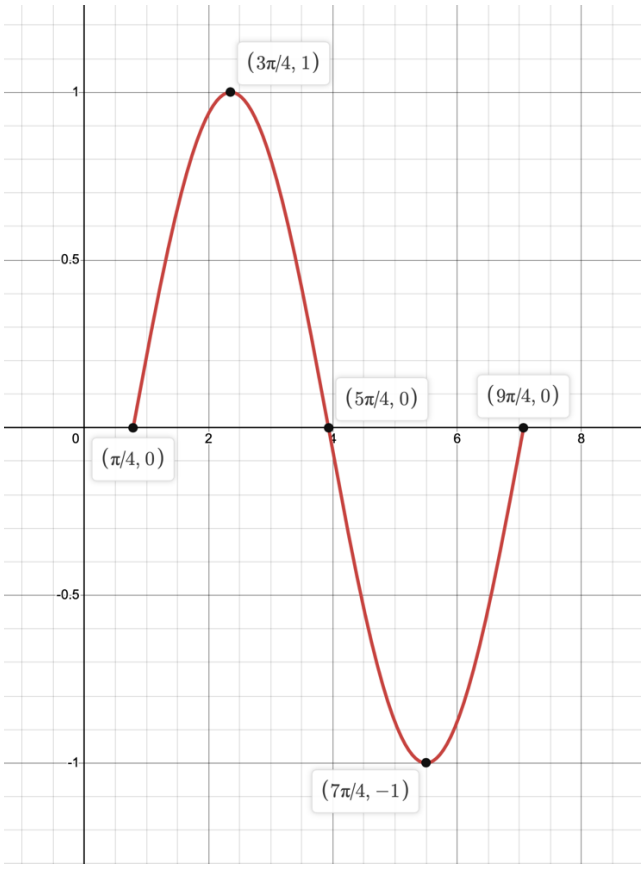
Answers

1.



$$amp = 1, period = 2\pi, phase\ shift = \frac{\pi}{3}, Interval = \left[\frac{\pi}{3}, \frac{7\pi}{3}\right],$$
$$xint: x = \frac{\pi}{3}, x = \frac{4\pi}{3}, x = \frac{7\pi}{3}$$
$$min = -1, max = 1$$

2.

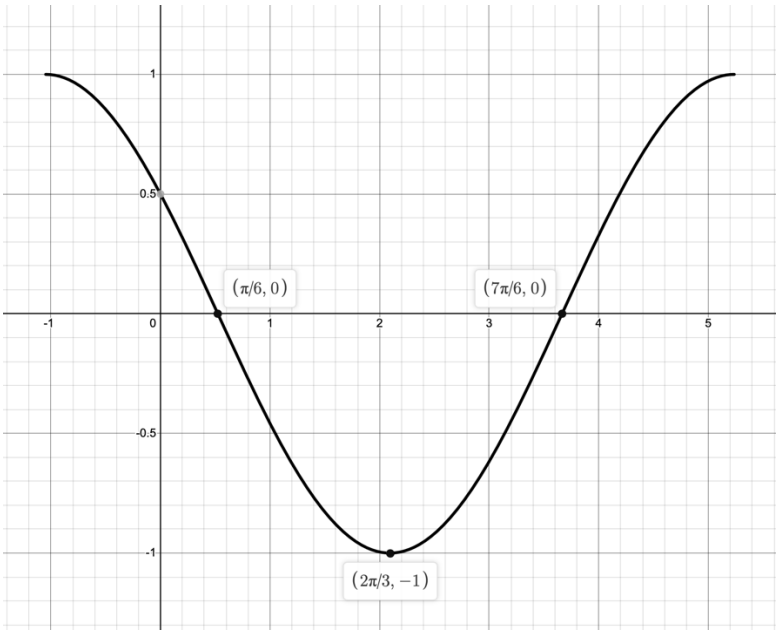


$$amp = 1, period = 2\pi, phase\ shift = \frac{\pi}{4}, Interval = \left[\frac{\pi}{4}, \frac{9\pi}{4}\right]$$

$$xint: x = \frac{\pi}{4}, x = \frac{5\pi}{4}, x = \frac{9\pi}{4}$$

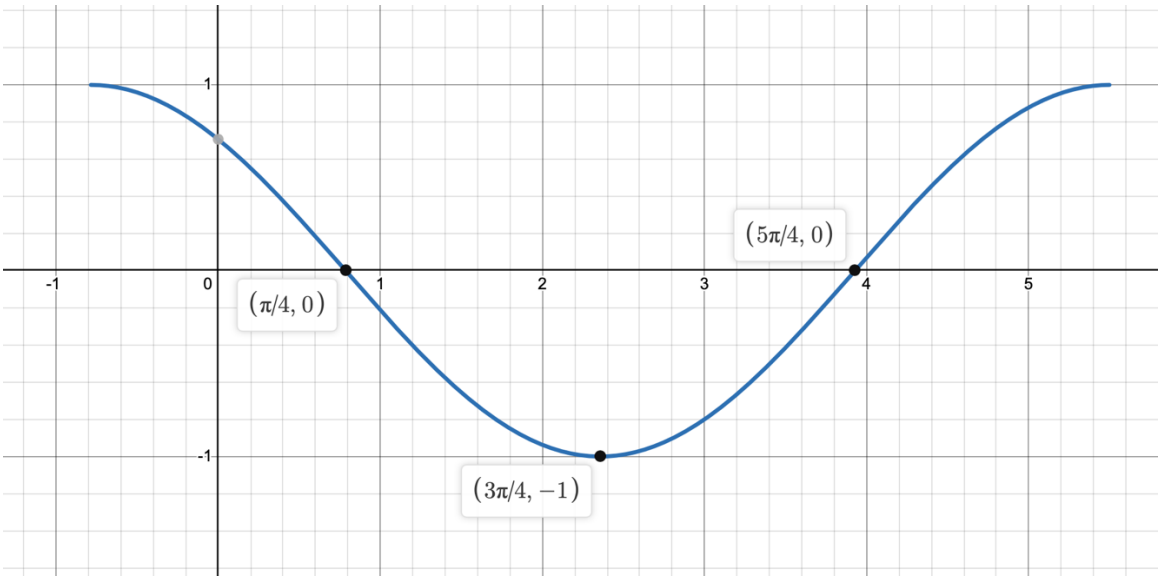
$$min = -1, max = 1$$

3.



$$amp = 1, period = 2\pi, phase\ shift = -\frac{\pi}{3}, Interval = \left[-\frac{\pi}{3}, \frac{5\pi}{3}\right],$$
$$xint: x = \frac{\pi}{6}, x = \frac{7\pi}{6}$$
$$min = -1, max = 1$$

4.

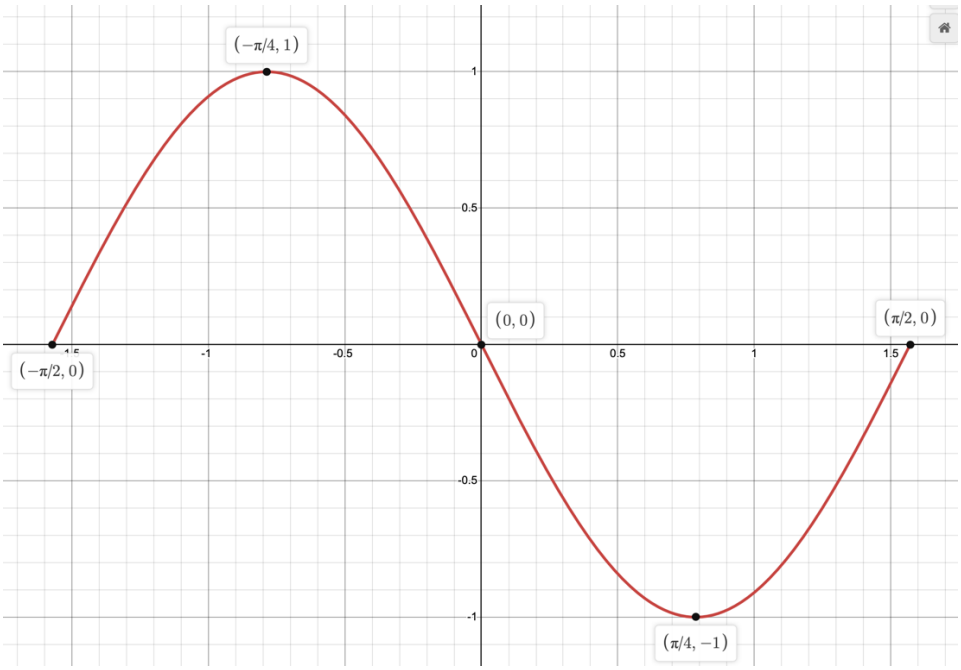


$$amp = 1, period = 2\pi, phase\ shift = -\frac{\pi}{4}, Interval = \left[-\frac{\pi}{4}, \frac{7\pi}{4}\right]$$

$$xint: x = \frac{\pi}{4}, x = \frac{5\pi}{4}$$

$$min = -1, max = 1$$

5.

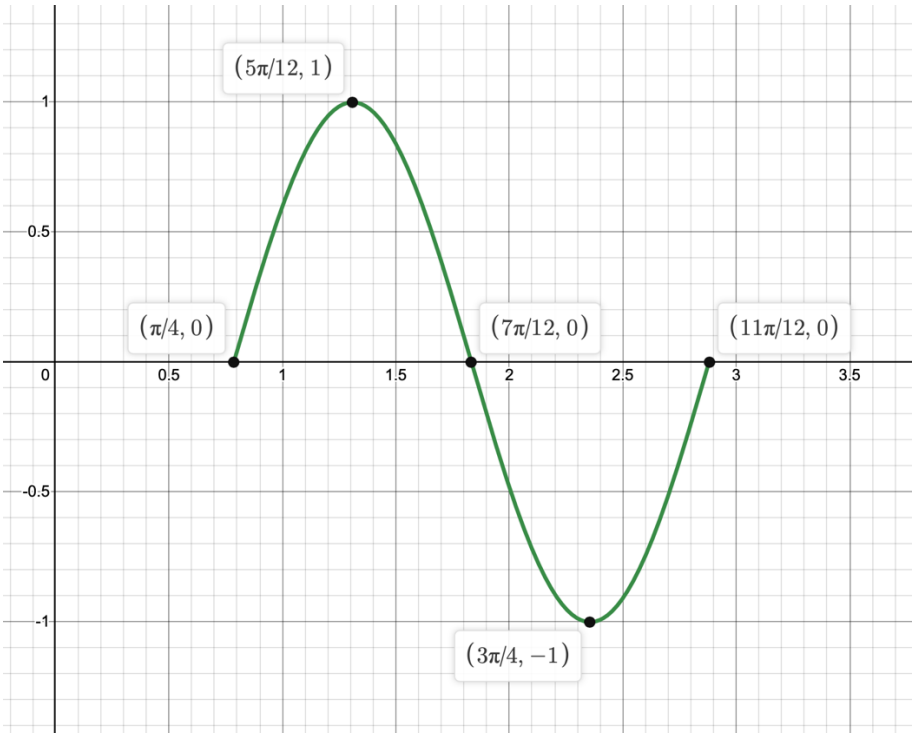


$$amp = 1, period = \pi, phase\ shift = -\frac{\pi}{2}, Interval = \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$$

$$xint: x = -\frac{\pi}{2}, x = 0, x = \frac{\pi}{2}$$

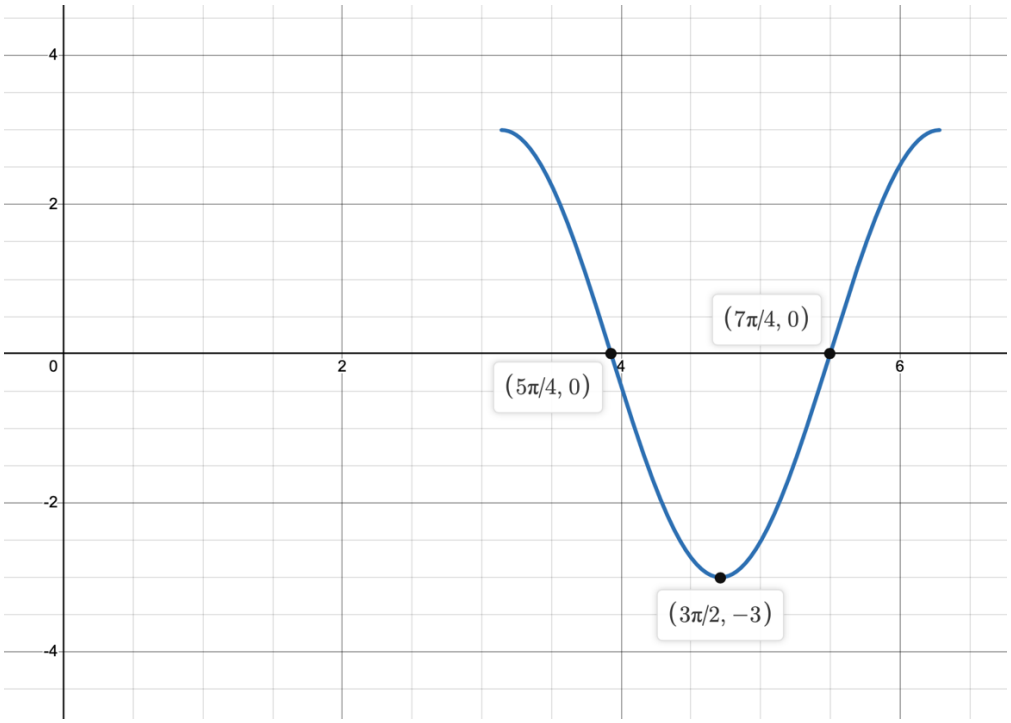
$$min = -1, max = 1$$

6.



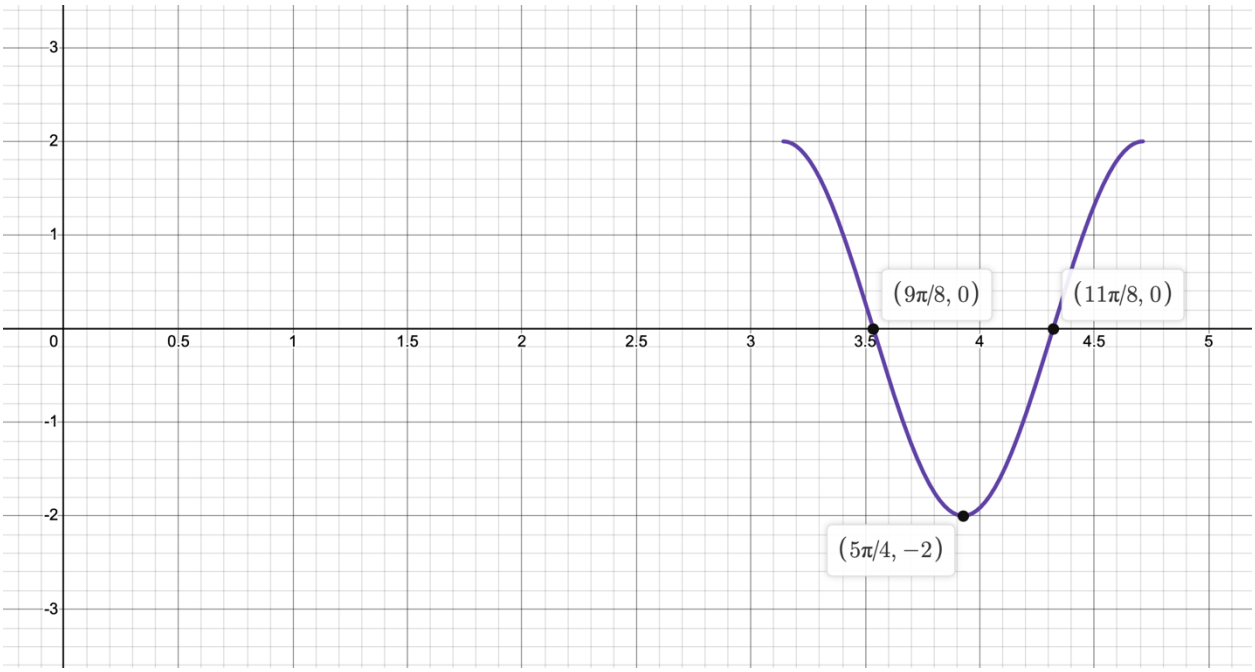
$$amp = 1, period = \frac{2\pi}{3}, phase\ shift = \frac{\pi}{4}, Interval = \left[\frac{\pi}{4}, \frac{11\pi}{12}\right],$$
$$xint: x = \frac{\pi}{4}, x = \frac{7\pi}{12}, x = \frac{11\pi}{12}$$
$$min = -1, max = 1$$

7.



$$amp = 3, period = \pi, phase\ shift = \pi, Interval = [\pi, 2\pi]$$
$$xint: x = \frac{5\pi}{4}, x = \frac{7\pi}{4}$$
$$min = -3, max = 3$$

8.

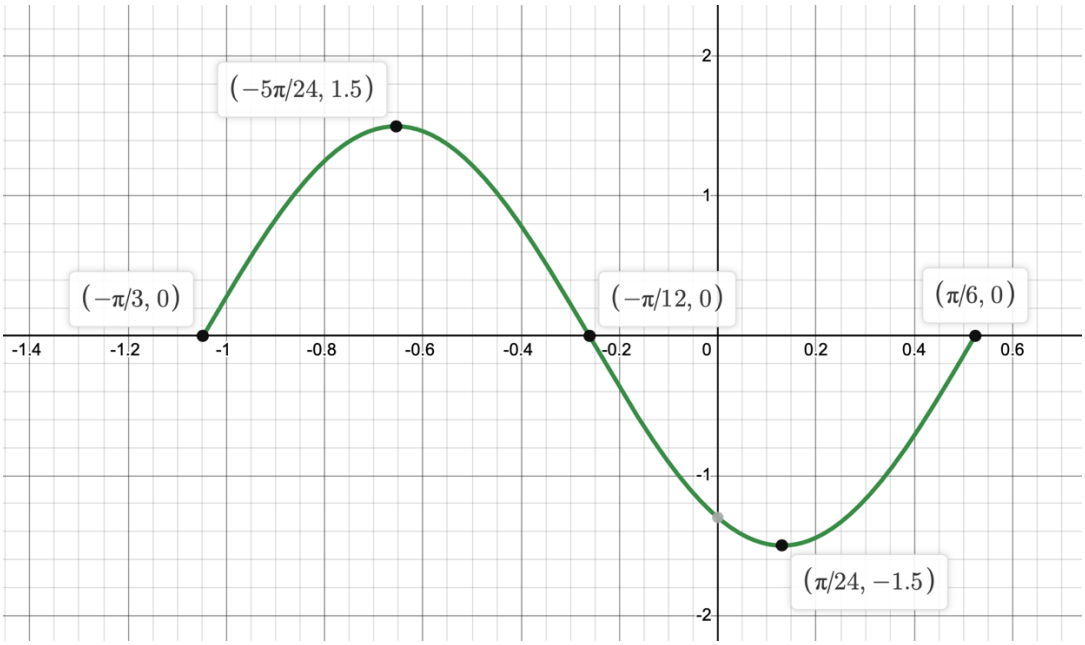


$$amp = 2, period = \frac{\pi}{2}, phase\ shift = \pi, Interval = \left[\pi, \frac{3\pi}{2}\right]$$

$$xint: x = \frac{9\pi}{8}, x = \frac{11\pi}{8}$$

$$min = -2, max = 2$$

9.

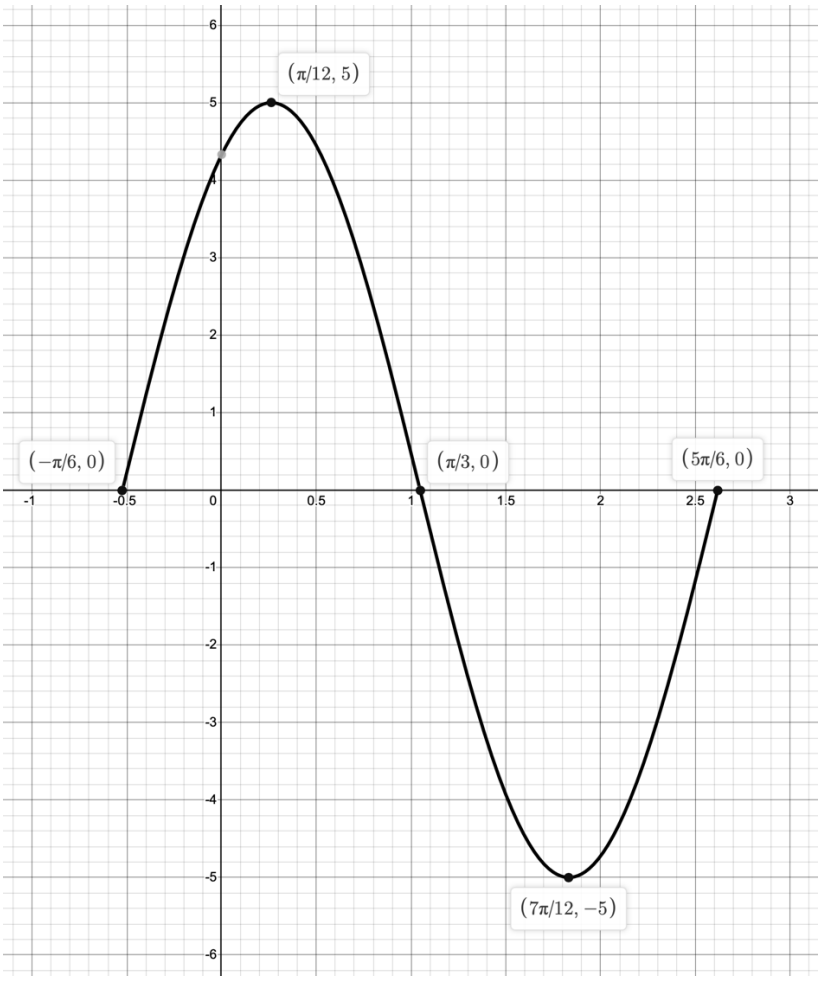


$$amp = \frac{3}{2}, period = \frac{\pi}{2}, phase\ shift = -\frac{\pi}{3}, Interval = \left[-\frac{\pi}{3}, \frac{7\pi}{6}\right]$$

$$xint: x = -\frac{\pi}{3}, x = -\frac{\pi}{12}, x = \frac{\pi}{6}$$

$$min = -\frac{3}{2}, max = \frac{3}{2}$$

10.

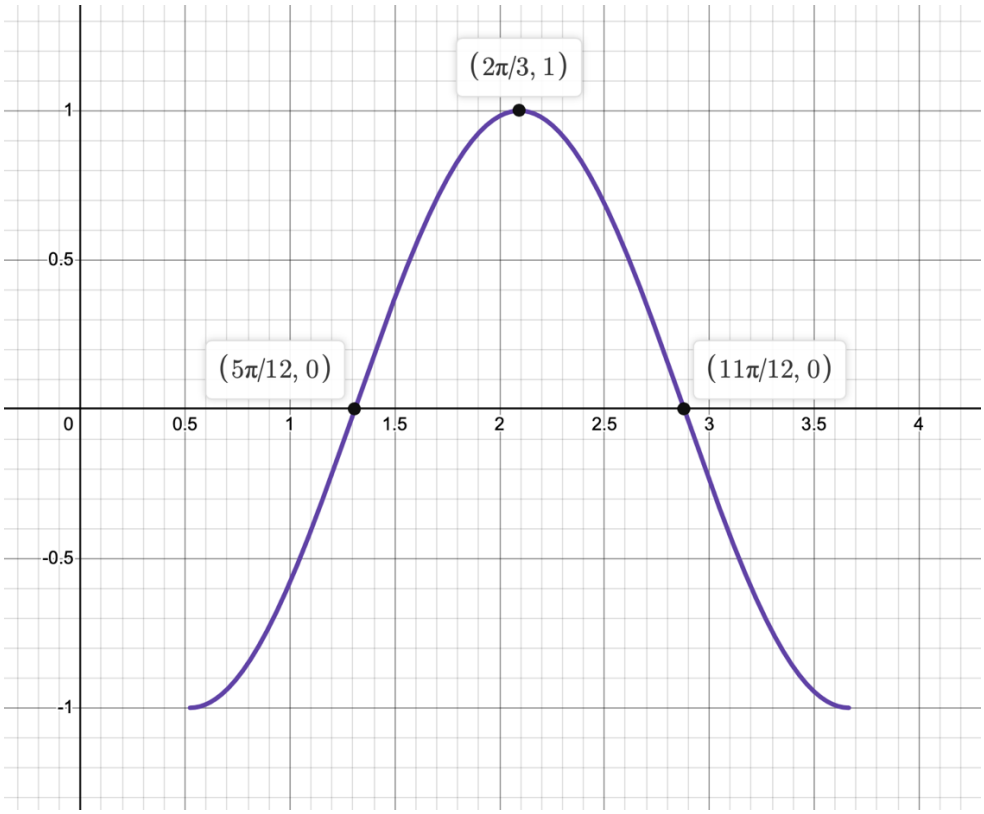


$$amp = 5, period = \pi, phase\ shift = -\frac{\pi}{6}, Interval = \left[-\frac{\pi}{6}, \frac{5\pi}{6}\right]$$

$$xint: x = -\frac{\pi}{6}, x = \frac{\pi}{3}, x = \frac{5\pi}{6}$$

$$min = -5, max = 5$$

11.

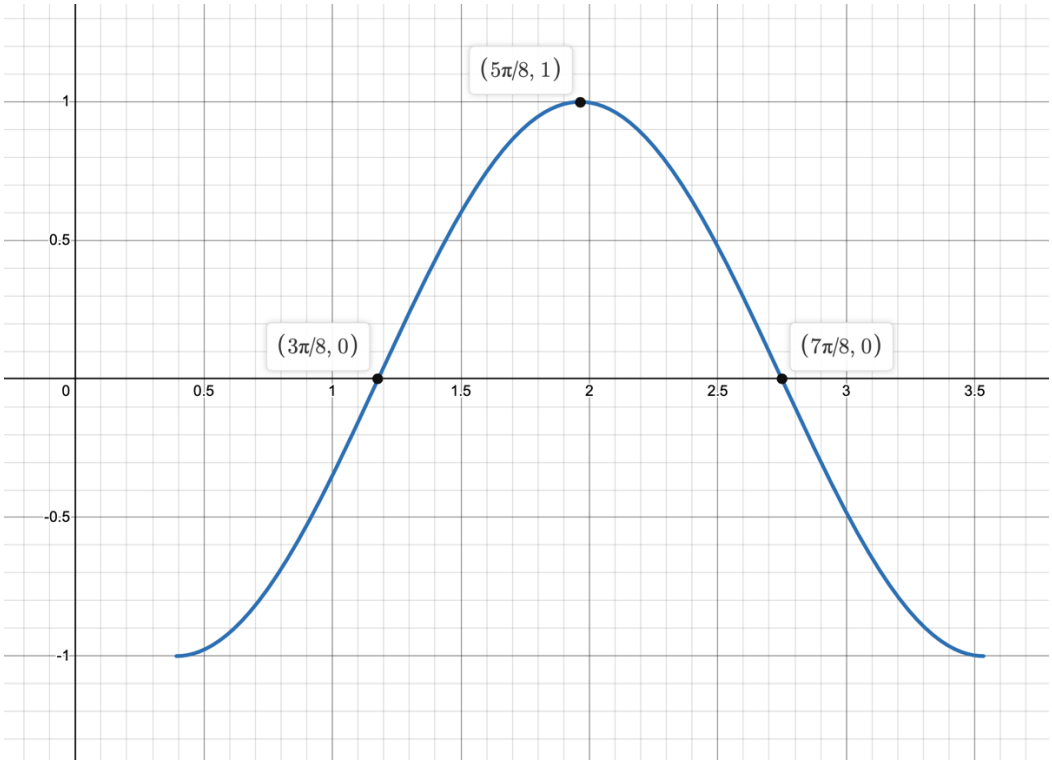


$$amp = 1, period = \pi, phase\ shift = \frac{\pi}{6}, Interval = \left[\frac{\pi}{6}, \frac{7\pi}{6}\right]$$

$$xint: x = \frac{5\pi}{12}, x = \frac{11\pi}{12}$$

$$min = -1, max = 1$$

12.

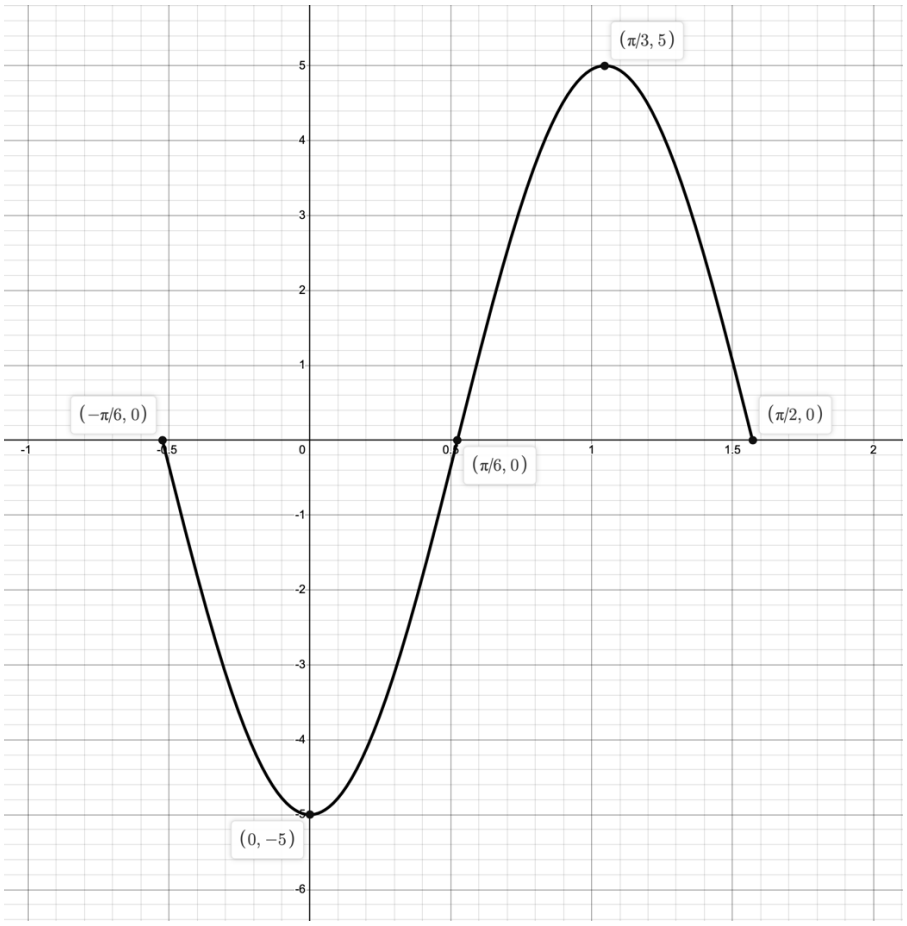


$$amp = 1, period = \pi, phase\ shift = \frac{\pi}{8}, Interval = \left[\frac{\pi}{8}, \frac{9\pi}{8}\right]$$

$$xint: x = \frac{3\pi}{8}, x = \frac{7\pi}{8}$$

$$min = -1, max = 1$$

13.

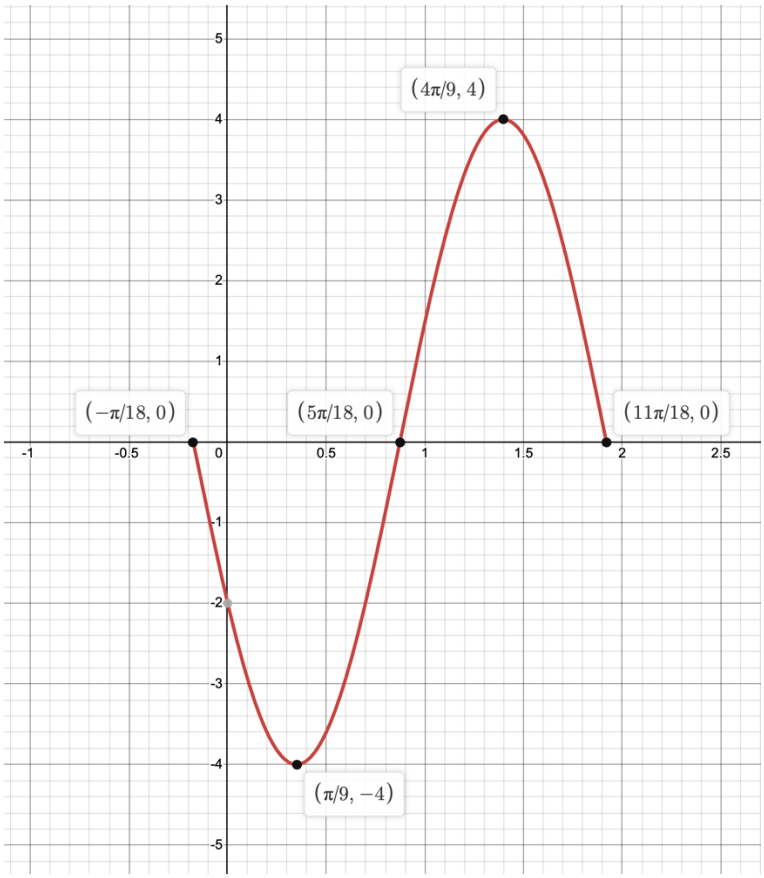


$$amp = 5, period = \frac{2\pi}{3}, phase\ shift = -\frac{\pi}{6}, Interval = \left[-\frac{\pi}{6}, \frac{\pi}{2}\right]$$

$$xint: x = -\frac{\pi}{6}, x = \frac{\pi}{6}, x = \frac{\pi}{2}$$

$$min = -5, max = 5$$

14.



$$amp = 4, period = \frac{2\pi}{3}, phase\ shift = -\frac{\pi}{18}, Interval = \left[-\frac{\pi}{18}, \frac{11\pi}{18}\right],$$
$$xint: x = -\frac{\pi}{18}, x = \frac{5\pi}{18}, x = \frac{11\pi}{18}$$
$$min = -4, max = 4$$