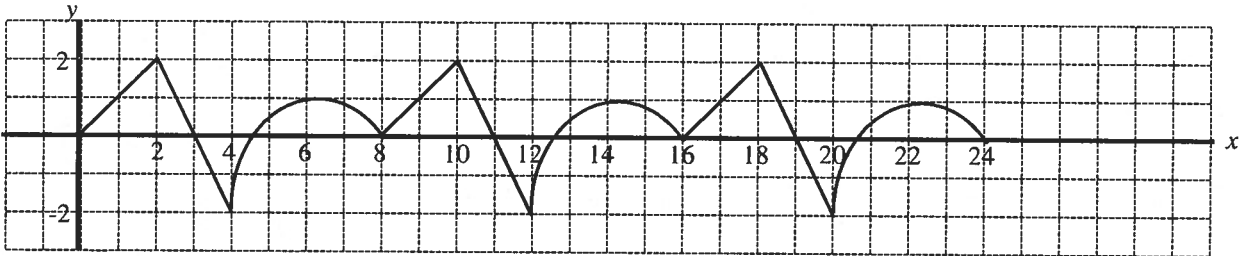


Trig Functions – Practice Test *SOLUTIONS*

1. Complete the following table.

Degrees	-270°	405°	105°	390°
Radians	$-\frac{3\pi}{2}$	$\frac{9\pi}{4}$	$\frac{7\pi}{12}$	$\frac{13\pi}{6}$

2. Given the following graph of a periodic function:

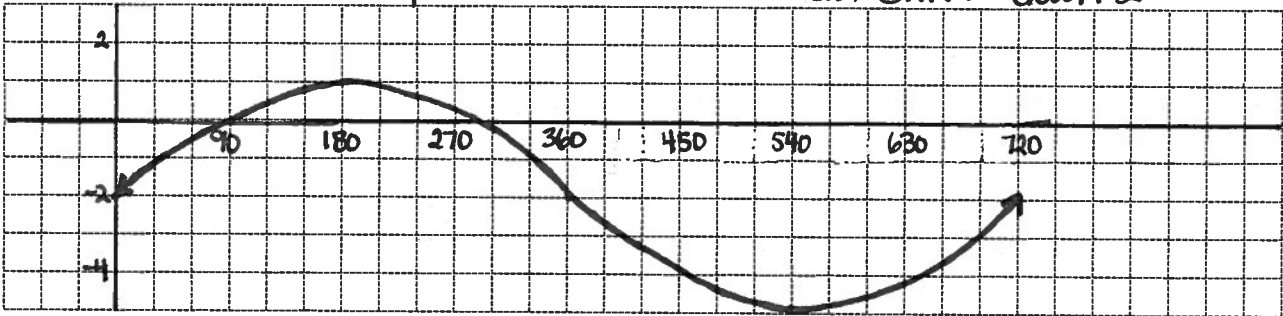


State the following:

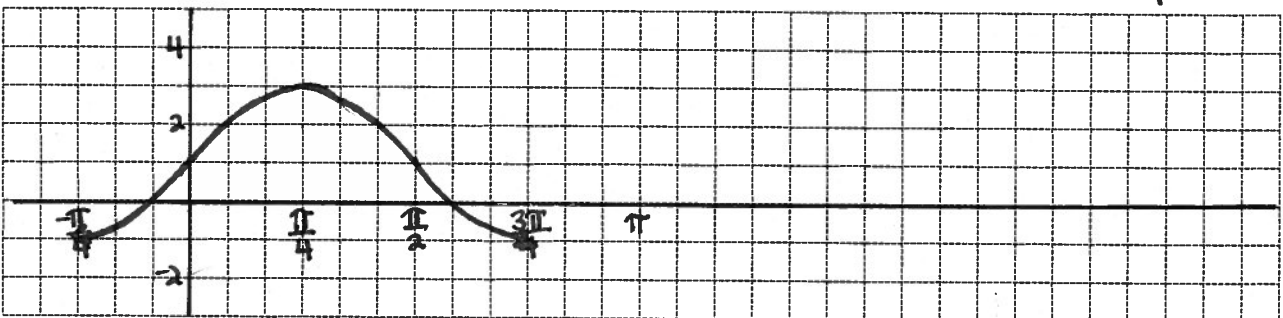
- a) amplitude $a = \frac{|2 - (-2)|}{2} = 2$ b) period $\text{period} = 8$ c) domain $D = \{x \in \mathbb{R} \mid 0 \leq x \leq 24\}$ d) range $R = \{y \in \mathbb{R} \mid -2 \leq y \leq 2\}$

3. Graph **one complete cycle** for each of the following trig functions. For each graph, state the amplitude, period, and any phase shift and/or vertical shift.

- a) $y = 3\sin\left(\frac{x}{2}\right) - 2$ amplitude = 3 period = $\frac{360}{\frac{1}{2}} = 720^\circ$
 no phase shift vertical shift: down 2



- b) $y = -2\cos\left[2\theta + \frac{\pi}{2}\right] + 1 \Rightarrow y = -2\cos\left[2\left(\theta + \frac{\pi}{4}\right)\right] + 1$ amplitude = 2 period = $\frac{2\pi}{2} = \pi$
 phase shift = left $\frac{\pi}{4}$ vert. shift: up 1



4. Write the equation for a sine function with amplitude of 3, period of 180° , phase shift 45° left, and vertical shift up 2 units.

$$q=2$$

$$a=3$$

$$180 = \frac{360}{k}$$

$$p = -45^\circ$$

$$\therefore k=2$$

$$\therefore y = 3 \sin[2(x+45^\circ)] + 2$$

5. The water depth in a harbor is 6 m at low tide and 18 m at high tide. One cycle is completed every 12 hours.

- a) Determine the equation for the water depth, d , as a function of time, t hours after high tide, which occurs at 6:00 am. * Let t be the time (in hours) since 6 am.

$$a = \frac{|18-6|}{2} = 6$$

$$12 = \frac{360}{k}$$

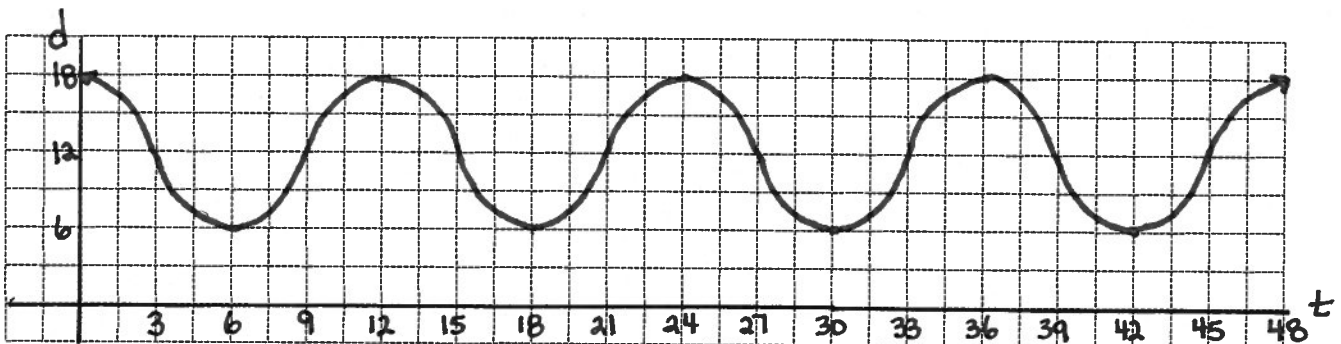
* use $d = \cos t$ as base function

no phase shift
vert. shift up 12

$$k=30$$

$$\therefore d = 6 \cos(30t) + 12$$

- b) Draw the graph of the function for a 48 hours after high tide. (ie. draw 4 cycles)



- c) Determine the depth of the water at 11:00 am. At 11:00 am, $t=5$.

$$d = 6 \cos[30(5)] + 12$$

$$= 6 \cos(150^\circ) + 12$$

$$= 6.8 \text{ m}$$

\therefore At 11:00 am, the depth of water is 6.8 m.

- d) At what time(s) is the depth 15 m? Sub. $d=15 \text{ m}$

$$15 = 6 \cos(30t) + 12$$

$$\frac{15-12}{6} = \cos(30t)$$

$$0.5 = \cos(30t)$$

$$t = \frac{\cos^{-1}(0.5)}{30}$$

$$t=2 \quad \text{or} \quad t=12-2$$

$$t=10$$

\therefore The depth is 15 m after 2h (ie. at 8:00 am) or after 10h (ie. at 4:00 pm).