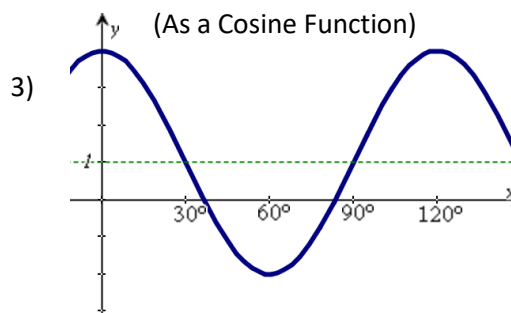


***** Do all work on notebook paper! *****

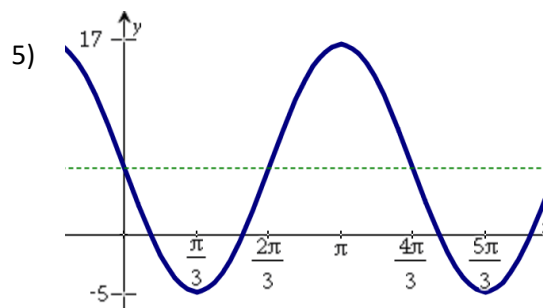
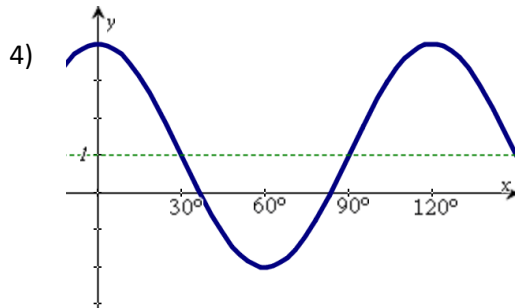
State the amplitude, period, phase shift, domain (of one phase) and range for each of the following functions:

1) $y = -2 \sin 3 \left(x - \frac{2\pi}{9} \right)$

2) $y = 3 \cos 5 \left(x + \frac{\pi}{20} \right)$



Write the equation for each of the following functions:



6) a cosine function with amplitude 3, period 90° , phase shift 60° , reflected across the horizontal axis

7) a sine function with amplitude $\frac{1}{3}$, period 60° , phase shift -30° , vertical shift down 2

For each application, graph the function, write an equation, and answer the relevant questions using the technology of a graphing calculator.

8) The Ferris wheel at the landmark Navy Pier in Chicago takes 7 minutes to make one full rotation. The radius of the Ferris wheel is 70 feet. You enter the ride at 10 feet above the ground.

a) Graph and write a function to show how one passenger's height above the ground varies with time as she rides the Ferris wheel.

b) Determine how high above the ground the passenger is 5 minutes into the ride.

c) Determine the number of minutes the passenger has been on the ride when she first reaches a height of 30 feet.

9) Assume that you are aboard a research submarine doing submerged training exercises in the Pacific Ocean. At time $t = 0$, you start porpoising (going alternately deeper and shallower). At time $t = 5$ minutes you are at your deepest depth, -1200 meters. At time $t = 15$ minutes, you next reach your shallowest depth, -300 meters. Assume that the depth varies sinusoidally with time.

- Graph and write an equation expressing your depth as a function of time.
- Your submarine can't communicate with ships on the surface when it is deeper than -400 meters. At time $t = 0$, could your submarine communicate? Explain your answer.
- Between what two nonnegative times is your submarine first able to communicate?

10) As you stop your car at a traffic light, a pebble becomes wedged between your tire treads. When you start moving again, the distance between the pebble and the pavement varies sinusoidally with the distance that your car has moved forward. The period is the circumference of the tire. The diameter of your tire is 26 inches.

- Graph and write an equation of the function that has **NO phase shift**.
- What is the pebble's distance from the pavement when you have gone 14 inches?
- What are the first two distances you have gone when the pebble is 10 inches from the pavement?

11) The height of an object varies sinusoidally over time. A maximum height of 21 inches occurs at 2 hours. The next minimum height is 8 inches and occurs at 6 hours.

- Graph and write an equation to model this situation.
- What is the height of the object at 22.3 hours?
- What is the first time after 3 hours that the height of the object is 18 inches?

Trig Graphing – Sine & Cosine Review – Answers

1) amp = 2; period = $\frac{2\pi}{3}$; phase shift = $\frac{2\pi}{9}$; D: $\left[\frac{2\pi}{9}, \frac{8\pi}{9}\right]$; R: $[-2, 2]$

2) amp = 3; period = $\frac{2\pi}{5}$; phase shift = $-\frac{\pi}{20}$; D: $\left[-\frac{\pi}{20}, \frac{7\pi}{20}\right]$; R: $[-3, 3]$

3) amp = 3; period = 120° ; phase shift = 0; D $[0^\circ, 120^\circ]$; R $[-2, 4]$

4) $y = 3 \cos 3\theta + 1$ or $y = -3 \sin 3(\theta - 30^\circ) + 1$

5) $y = -11 \sin\left(\frac{3}{2}x\right) + 6$

6) $y = -3 \cos 4(\theta - 60^\circ)$

7) $y = \frac{1}{3} \sin 6(\theta + 30^\circ) - 2$

8) b) $h(5) = 95.6$ feet c) $h(t) = 30$ feet when $t = 0.9$ minutes

9) b) no – you'd be 750 feet below the surface c) between 12.8 minutes and 17.2 minutes

10) b) $d(14) = 6.84$ inches c) $x = 17.4$ inches and $x = 64.3$ inches

11) b) $h(22.3) = 8.18$ inches c) $t = 3.28$ hours