

## Trig Review – Inverse Trig Equations

Find the general solution for  $\theta$  (degrees) to 2 decimal places or  $x$  (radians) to 4 decimal places.

1.  $\theta = \sin^{-1} 0.3$
2.  $x = \cos^{-1}(-0.2)$
3.  $\theta = \tan^{-1} 6$
4.  $\theta = \sec^{-1}(1.5)$
5.  $5 \sin x + 4 = 0$

Find the first three positive answers for problem 6-8

6.  $x = \pm 6.52 + 11n$
7.  $x = -2.54 + 2n$  and  $x = 3.12 + 2n$
8.  $x = 6.3 + 2\pi n$  and  $x = -9.7 + 2\pi n$
9. A guitar string is plucked so that it vibrates with a frequency of  $1/61$  seconds. Suppose the maximum displacement at the center of the string is  $s(0) = 0.54$ . Find an equation to model this displacement. Round constants to 2 decimal places.
10. The number of hours of darkness in a coastal town can be modeled by  $f(x) = 12.1 + 6.1 \cos \frac{\pi}{6}(x - 2)$ , where  $x$  is the month and  $x = 1$  corresponds to January. Approximate the number of hours of darkness in April, to the nearest tenth of an hour.

11. Given:  $f(x) = 6 + 8 \cos \frac{\pi}{7}(x - 4)$ 
  - a) Find  $f(17)$ .
  - b) Find the first three positive values of  $x$  for which  $f(x) = 11$ .
12. Find the first three positive values of  $x = \cos^{-1}(-0.9)$ .
13. As you ride a bicycle, the distance between your foot and the pavement varies sinusoidally with the horizontal distance the bicycle has gone. Suppose that you start with your right foot somewhere between a high point and a low point, and push down. When you have gone 5 m, your right foot first reaches its lowest point, 11 cm above the pavement. The high points are 45 cm above the pavement. The bicycle moves a horizontal distance of 16.4 m for each complete revolution of the pedals,
  - a) Sketch the graph of the sinusoid
  - b) Write a particular equation of the sinusoid,
  - c) How high was your right foot when you first started?
14. The maximum monthly average temperature in Smithville is  $87^\circ$  in July, and the minimum is  $33^\circ$  in January. Determine  $f(x)$  that models the monthly average temperature in Smithville, where  $x$  is the month and  $x = 1$  corresponds to January.

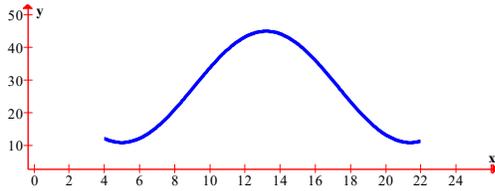
15. The distance between Earth and Mars is (approximately) a sinusoidal function of time whose equation is  $d = 228 + 93 \cos \frac{\pi}{390}(t - 560)$  where  $t$  is the number of days after today, and  $d$  is in millions of miles.
  - a) Sketch the graph.
  - b) How far apart are the two planets today?
  - c) What is the farthest they are apart? the closest?
  - d) How much time elapses between times of closest approach?
  - e) What are the first two positive times between which Mars will be within 200 million miles of Earth?
16. The position of a weight attached to a spring is  $s(t) = -6 \cos 16\pi t$  inches after  $t$  seconds. What is the maximum height that the weight reaches above the equilibrium position and when does it first reach the maximum height?
17. Astronomers believe that the radius of a variable star increases and decreases with the brightness of the star. The certain variable star has an average radius of 25 million miles and changes by a maximum of 1.5 million miles from this average during a single pulsation. The time between periods of maximum brightness is 5.4 days. Find an equation that describes the radius of this star as a function of time.
18. In a predator/prey model, the predator population is modeled by the function  $y = 7000 + 800 \cos 3t$  where  $t$  is measured in years.
  - (a) What is the maximum population?
  - (b) Find the length of time between successive periods of maximum population. Please round the answer to the nearest hundredth.
19. The original Ferris wheel, built by George Ferris for the 1893 World's Fair, was much larger and slower than its modern counterparts. It had a diameter of 250 feet and contained 36 cars, each of which held 40 people. It made one revolution every 10 minutes and reached a maximum height of 264 feet. Grover Cleveland was given a private ride. He got on and the wheel starting slowly turning.
  - a.) Sketch a graph of this sinusoid.
  - b.) Write an equation expressing Grover's height above the ground in terms of time (in minutes) since the Ferris wheel started turning.
  - c.) How high was Grover after 16 minutes?
  - d.) When was he 200 feet above the ground for the 4th time?

Answers:

1.  $17.46 + 360n$  and  $162.54 + 360n$
2.  $\pm 1.772 + 2\pi n$
3.  $80.54 + 180n$
4.  $\pm 48.19 + 360n$
5.  $-0.9273 + 2\pi n$  and  $4.0689 + 2\pi n$
6. 4.48, 6.52, 15.48
7. 1.12, 1.46, 3.12
8. 0.017, 2.867, 6.3
9.  $s(t) = 0.54 \cos 383.27t$
10. 15.2 hours
11. a. 13.208  
b.  $5.996 + 14n$  and  $2.004 + 14n$   
2.004, 5.996, 16.004

12. 2.69, 3.59, 8.97

13.a.

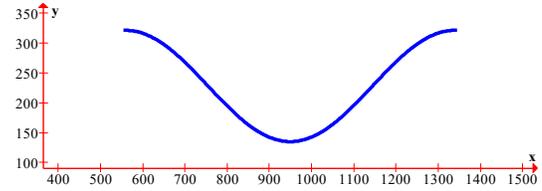


b.  $y = 28 - 17 \cos \frac{\pi}{8.2}(x - 5)$

c. 33.75 cm

14.  $f(x) = 60 + 27 \cos \frac{\pi}{6}(x - 7)$

15.a.



b. when  $t = 0$ , 209 millions miles

c. Farthest 321 million miles

Shortest 135 million miles

d. 780 days

e. Between 13 and 327 days

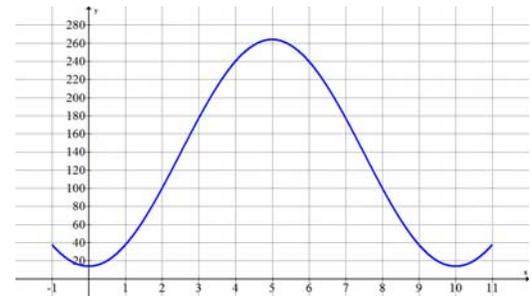
16. The maximum height of 6 inches is first reached after 0.06 seconds

17.  $R(t) = 25 + 1.5 \sin \left( \frac{2\pi}{5.4} t \right)$ , where R is in millions of miles and t is in days.

18a. 7,800

b. 2.09

19.a.



b.  $y = 139 - 125 \cos \frac{\pi}{5} t$  or  $y = 139 + 125 \cos \frac{\pi}{5}(t - 5)$

c.  $y = 240.127$  ft

d.  $t = 16.689$  min.