Pre-calculus: **Name _____ period_____ date_____ score_____**

4.5 Homework

Find the exact value of each trigonometric function without using a calculator.

1. $\cos 0$
2. $\cot(\pi/6)$
3. $\sin(-\pi/4)$
4. $\sec(\pi/3)$
5. $\cos(\pi/2)$

6. $\tan(-\pi)$
7. $\csc(-5\pi/6)$
8. $\sec(2\pi/3)$
9. $\cos(-3\pi/4)$
10. $\sin(3\pi/2)$

Find the coordinates of each point after it is moved π/3 units to the left and 4 units down.

11. $(\pi/4, 2)$
12. $(-\pi/2, -1)$

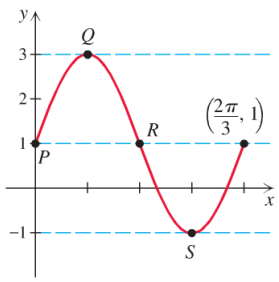
Find the coordinates of each point after it is moved π/6 units to the right and 2 units up.

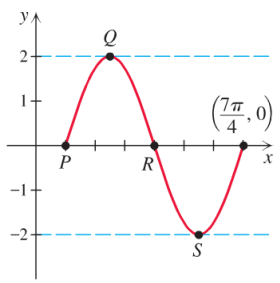
13. $(\pi/3, -1)$
14. $(-\pi, 5)$

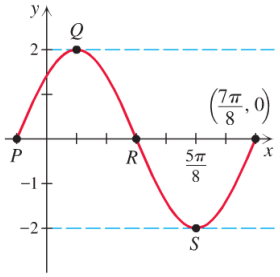
Determine the midpoint of the two given points.

15. $(0, -2)$ and $(\pi/3, -2)$
16. $(\pi/6, 1)$ and $(\pi/2, 1)$

Determine the coordinates of points *P*, *Q*, *R*, and *S* on each given sine wave.

17. 

18. 

19. 

For each function, state the amplitude, phase shift, period, vertical shift (midline) and range.

20. $y = -3\sin x$

amplitude_____

phase shift_____

period_____

midline_____

range_____

21. $y = \cos\left(x - \pi/3\right)$

amplitude_____

phase shift_____

period_____

midline_____

range_____

22. $f\left(x\right) = \sin\left[2\left(x - \frac{\pi}{2}\right)\right]$

amplitude_____

phase shift_____

period_____

midline_____

range_____

23. $y = -\sin\left(x\right) - 1$

amplitude_____

phase shift_____

period_____

midline_____

range_____

24. $f\left(x\right) = \sin\left(x + \pi/4\right) + 2$

amplitude_____

phase shift_____

period_____

midline_____

range_____

25. $f\left(x\right) = 2\cos\left(x - \pi/6\right) + 1$

amplitude_____

phase shift_____

period_____

midline_____

range_____

26. $y = 3\cos\left(x + 2\pi/3\right) - 2$

amplitude_____

phase shift_____

period_____

midline_____

range_____

27. $f\left(x\right) = -2\sin\left(x - \pi/3\right) + 1$

amplitude_____

phase shift_____

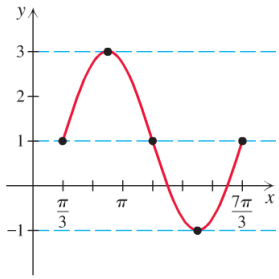
period_____

midline_____

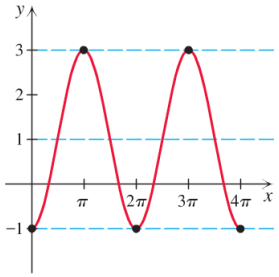
range_____

Write an equation of the requested form whose graph is the given sine wave.

28. $y = a\sin\left(x - c\right) + d$



29. $y = a\cos\left(x - c\right) + d$



Write the equation of each sine wave in its final position.

30. The graph of $y = \sin\left(x\right)$ is reflected over the *x*-axis, shifted $\pi/9$ units to the left, then translated down 3 units.

31. The graph of $y = \cos\left(x\right)$ is reflected over the *x*-axis, vertically stretched by a factor of 3, shifted $\pi/4$ units to the left, translated down 5 units.

Determine the vertical shift (midline), amplitude, phase shift, period, and range for each function. Make a table with the five key points and sketch at least one cycle of the graph with the five key points from the table. Label your axes clearly

32. $f(x) = -\sin(x)$

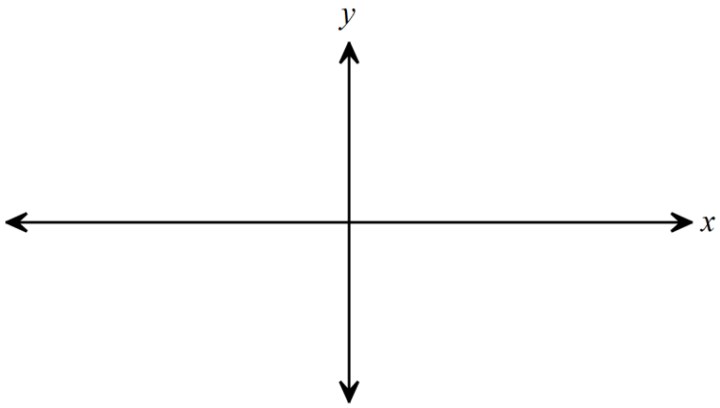
midline_____

amplitude_____

phase shift_____

period_____

range_____



33. $f(x) = \frac{1}{2}\cos(x)$

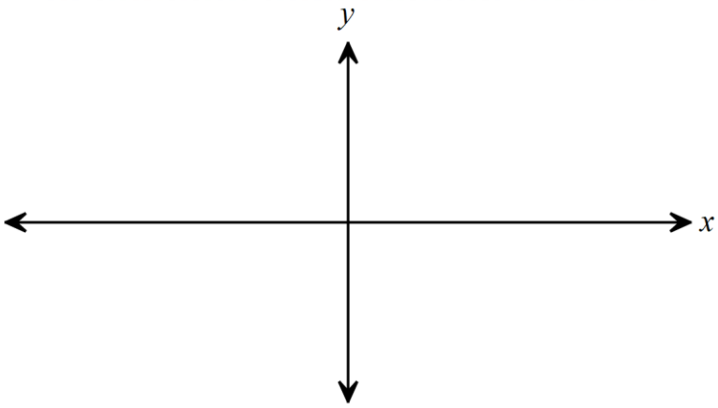
midline_____

amplitude_____

phase shift_____

period_____

range_____



34. $f(x) = \cos\left(x - \frac{\pi}{3}\right)$

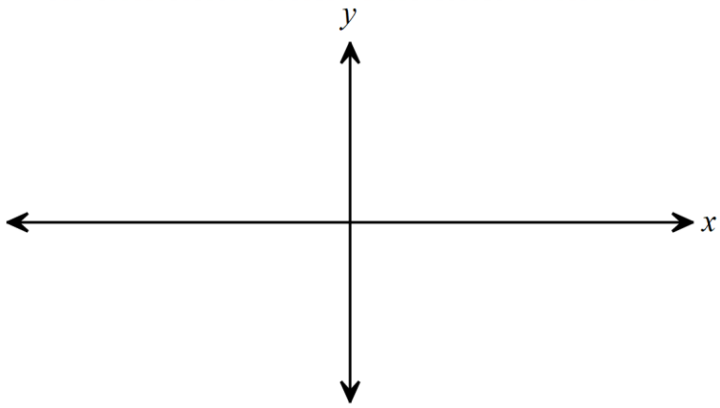
midline_____

amplitude_____

phase shift_____

period_____

range_____



35. $f(x) = \sin\left(x + \frac{\pi}{4}\right) + 2$

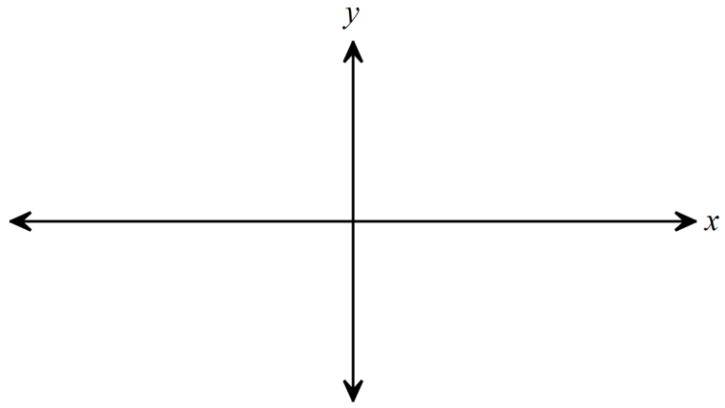
midline_____

amplitude_____

phase shift_____

period_____

range_____



36. $f(x) = 2\cos\left(x + \frac{\pi}{6}\right) + 1$

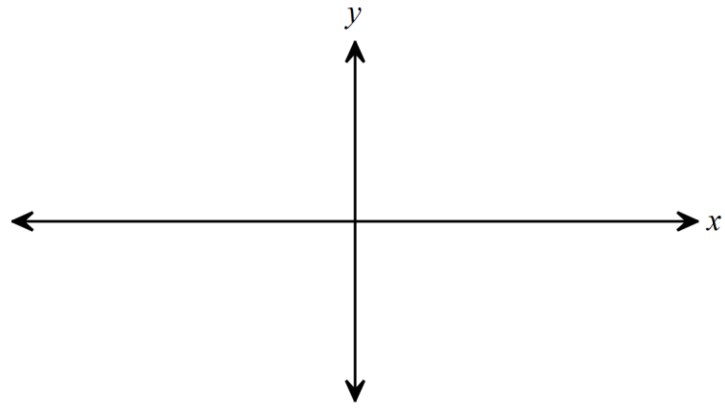
midline_____

amplitude_____

phase shift_____

period_____

range_____



37. $f(x) = \cos(4x) + 2$

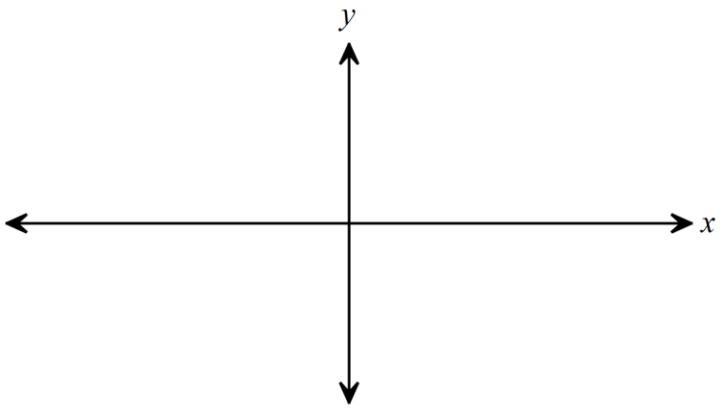
midline_____

amplitude_____

phase shift_____

period_____

range_____



38. $f(x) = 2 - \sin\left(\frac{x}{4}\right)$

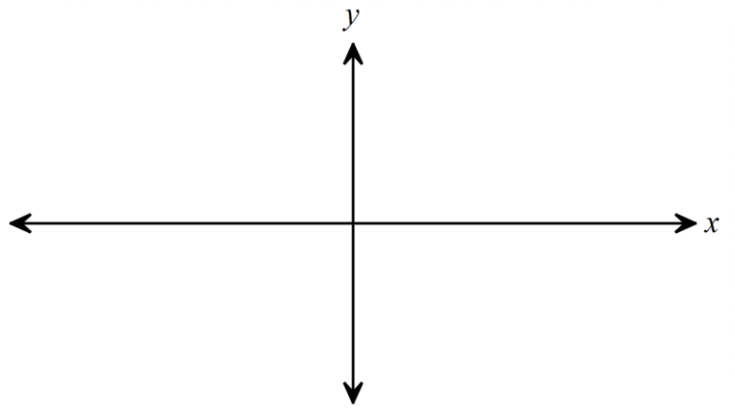
midline_____

amplitude_____

phase shift_____

period_____

range_____



39. $f(x) = -\frac{1}{2}\sin\left[3\left(x - \frac{\pi}{6}\right)\right] - 1$

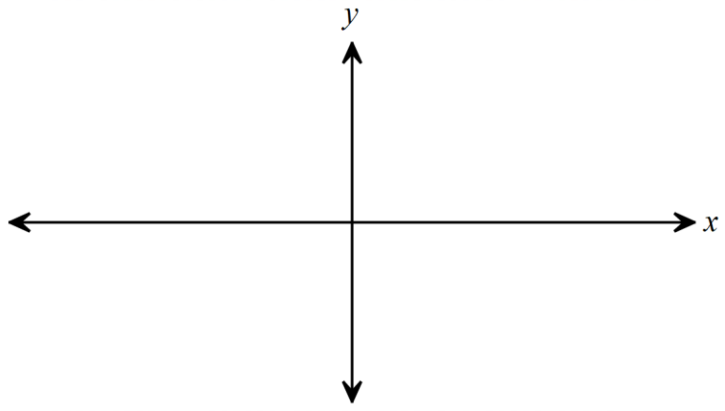
midline_____

amplitude_____

phase shift_____

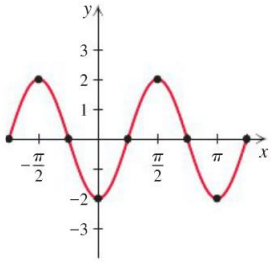
period_____

range_____

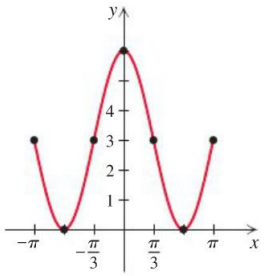


Write two equations to describe each graph – one of the form $y = a\sin\left[b\left(x-c\right)\right]+d$ and one of the form $y = a\cos\left[b\left(x-c\right)\right]+d$.

40.



41.



Solve each problem.

42. What is the frequency of the sine wave determined by $y = \cos\left(0.001\pi x\right)$, where x is the time in seconds?

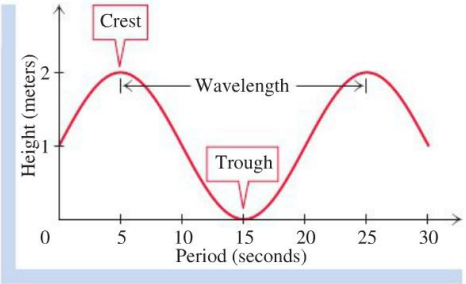
43. If the period of a sine wave is 0.025 hour, then what is the frequency?

44. If the frequency of a sine wave is 40,000 cycles per second, then what is the period?

45. The volume of air v in cubic centimeters in the lungs of a certain distance runner is modeled by the equation $v = 400\sin\left(60\pi t\right)+900$, where t is the time in minutes.

    a. What are the maximum and minimum volumes of air in the runner's lungs?
    b. How many breaths does the runner take per minute?

46. Scientists use the same types of terms to describe ocean waves that we use to describe sine waves. The *wave period* is the time between crests and the *wavelength* is the distance between crests. The *wave height* is the vertical distance from the trough to the crest. The accompanying figure shows a *swell* in a coordinate system. Write an equation for the swell, assuming that its shape is that of a sinusoid.



Review:

47. Find the smallest positive angle that is coterminal with $-23\pi/6$.

48. The terminal side of the angle β in standard position passes through the point $(-3,9)$. Find the exact values of $\sin\beta$, $\cos\beta$, $\tan\beta$, $\csc\beta$, $\sec\beta$, and $\cot\beta$.

49. A central angle of 60° intercepts an arc on a circle with an arc length of 5 cm. What is the radius of the circle?