Answers for Lesson 13-5 Exercises

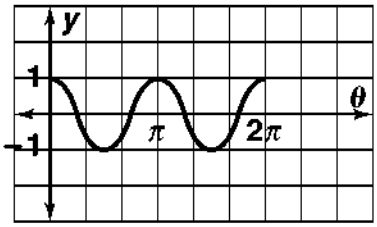
1. 2π, 3; max: 0, 2π; min: π; zeros: $\frac{\pi}{2}, \frac{3\pi}{2}$

2. $\frac{2\pi}{3}$,1; max: 0, $\frac{2\pi}{3}, \frac{4\pi}{3}, 2\pi$; min: $\frac{\pi}{3}, \pi, \frac{5\pi}{3}$; zeros: $\frac{\pi}{6}, \frac{\pi}{2}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{3\pi}{2}, \frac{11\pi}{6}$

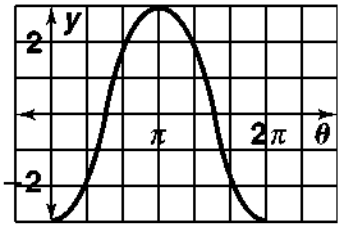
3. π, 1; max: 0, π, 2π; min: $\frac{\pi}{2}, \frac{3\pi}{2}$; zeros: $\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

4. 2π, 2; max: π; min: 0, 2π; zeros: $\frac{\pi}{2}, \frac{3\pi}{2}$

5.



6.



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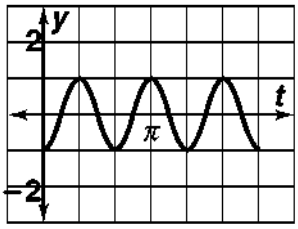

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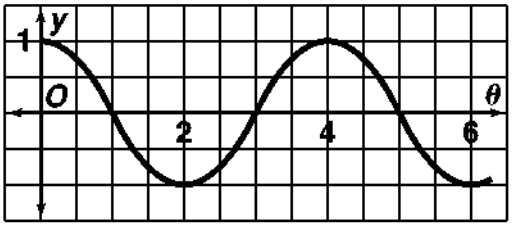

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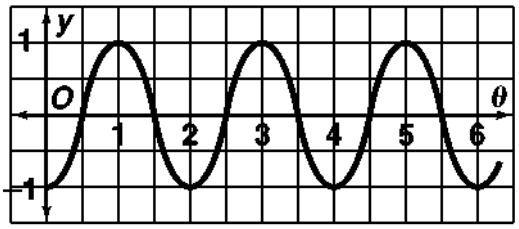


10. $y = 2\cos 2\theta$

11. $y = \frac{\pi}{2}\cos\frac{3\pi}{2}\theta$

12. $y = \pi\cos\pi\theta$

13. $y = -3\cos 2\theta$

14. $y = 2\cos\frac{\pi}{4}\theta$

15. $y = 4\cos\frac{3\pi}{2}\theta$

16. 0.52,2.62,3.67,5.76

17. 1.98,4.30

18. 0.55,1.45,2.55,3.45,4.55,5.45

19. 2.52

20. 0.00

21. 0.86,5.14

22. 2π, $-3 \leq y \leq 3$,3

23. π, $-1 \leq y \leq 1$,1

24. 4π, $-2 \leq y \leq 2$,2

25. 4π, $-\frac{1}{3} \leq y \leq \frac{1}{3}, \frac{1}{3}$

26. 6π, $-3 \leq y \leq 3$,3

27. $\frac{2\pi}{3}$,$-\frac{1}{2} \leq y \leq \frac{1}{2}, \frac{1}{2}$

28. $\frac{4}{3}$ $-16 \leq y \leq 16$,16

29. 2, $-0.7 \leq y \leq 0.7$, 0.7

30. 0.64, 2.50

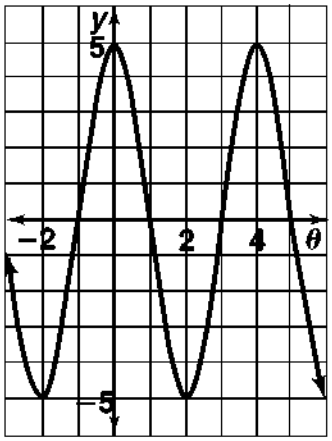
31. 1.83, 2.88, 4.97, 6.02

32. 0.50, 2.50, 4.50

33. a. 3.79, 5.64

b. 10.07, 11.92; these values are the sums of the values from part (a) and 2π.

34. a.



b. Answers may vary. Sample: 0 s, 4 s, 8 s, 12 s

c. 2 s; 2 s

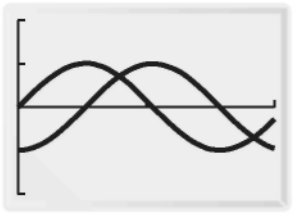
35. a. 5.5 ft; 1.5 ft

b. about 12 h 22 min

c. $y = 1.5 \cos \frac{2\pi t}{742}$

d. 12:17 A.M.-−7:49 A.M., 12:39 P.M.-8:11 P.M.

36. a. Answers may vary. Sample: sine; The sine function gives vertical position with respect to the center of the wheel.

b. 

Answers may vary. Sample: Going from left to right, the graph of Y2 = $\sin\left(x - \frac{\pi}{2}\right)$ "trails" the graph of Y1 = sin x by $\frac{\pi}{2}$ units. If the "ride" for Y2 would start $\frac{\pi}{2}$ units of time sooner than the ride for Y1, the two graphs would be identical from the origin on out.

c. 20 times as great

d. The center of the Ferris wheel is 20 ft higher at (0,20)

e. $f(x) = 20 \sin\left(x - \frac{\pi}{2}\right) + 20$

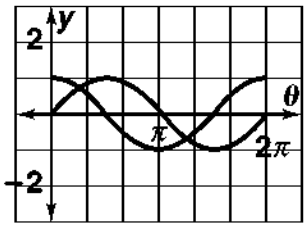
f. 

g. Allow for different values of 2 in $f(x) = 20 \sin b\left(x - \frac{\pi}{2}\right) = 20$. Model faster Ferris wheel speed by increasing the value of b. You can keep the starting point of the model at (0, 0) by letting b have value $4n - 3$, $n = 1, 2, \ldots$

h. In parametric mode, let $X_{1T} = T$, $Y_{1T} = 20 \sin\left(T - \frac{\pi}{2}\right) + 20$ and adjust Tstep values.

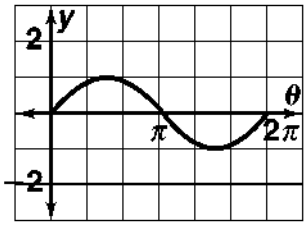
i. Answers may vary. Sample: You can use the cosine function to model horizontal position with respect to the center of the wheel.

37. a.



shift of $\frac{\pi}{2}$ units to the right

b.



They are the same.

c. To write a sine function as a cosine function, replace sin with cos and replace θ with $\theta - \frac{\pi}{2}$.

38. $y = \cos \frac{\pi}{12}x$ *or* $y = -\cos \frac{\pi}{12}x$

39. On the unit circle, the x-values of $-\theta$ *are* equal to the x-values of θ, so $\cos(-\theta) = \cos\theta$. $-\cos\theta$ is the opposite of $\cos\theta$, so these graphs are reflections of each other over the x-axis.