

# Practice 13-7

## Translating Sine and Cosine Functions

Graph each function in the interval from 0 to  $2\pi$ .

- |  |   |  |
|--|---|--|
| 1. $y = -\sin\left(x + \frac{\pi}{2}\right)$ | 2. $y = 3 \sin\left(x - \frac{\pi}{4}\right) + 2$ | 3. $y = \cos \frac{1}{2}x + 1$                 |
| 4. $y = 3 \cos(x - 2)$                       | 5. $y = \sin 3(x - \pi)$                          | 6. $y = \cos(x + 4)$                           |
| 7. $y = \cos x + 3$                          | 8. $y = -2 \sin x + 1$                            | 9. $y = -\cos 2\left(x + \frac{\pi}{4}\right)$ |
| 10. $y = \frac{1}{2} \cos x + 3$             | 11. $y = \sin \frac{1}{2}(x + \pi)$               | 12. $y = \cos\left(x + \frac{\pi}{6}\right)$   |
| 13. $y = -2\cos x + 3$                       | 14. $y = \sin 2x + 1$                             | 15. $y = \sin 2\left(x - \frac{\pi}{3}\right)$ |

Write an equation for each translation.

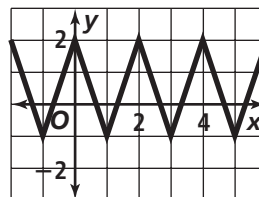
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|---|---|
| 16. $y = \sin x$ , 2 units down             | 17. $y = \cos x$ , $\pi$ units left       |
| 18. $y = \cos x$ , $\frac{\pi}{4}$ units up | 19. $y = \sin x$ , 3.2 units to the right |

Find the amplitude and period of each function. Describe any phase shift and vertical shift in the graph.

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|---|---|---------------------------------|
| 20. $y = 3 \cos x + 2$                        | 21. $y = -2 \sin\left(x + \frac{\pi}{2}\right)$ | 22. $y = \cos 2x + 1$           |
| 23. $y = -\sin\left(x - \frac{\pi}{3}\right)$ | 24. $y = \frac{1}{2} \cos x - 3$                | 25. $y = \cos \frac{1}{2}x - 2$ |

Use the function  $f(x)$  at the right. Graph each translation.

- |                    |                |
|--------------------|----------------|
| 26. $f(x) + 3$     | 27. $f(x + 1)$ |
| 28. $f(x) - 5$     | 29. $f(x + 3)$ |
| 30. $f(x + 2) - 1$ | 31. $f(x) - 4$ |



What is the value of  $h$  in each translation? Describe each phase shift (use a phrase like *3 units to the left*).

- |                       |  |                         |
|-----------------------|--|-------------------------|
| 32. $g(x) = f(x + 2)$ | 33. $g(x) = f(x - 1)$                        | 34. $h(t) = f(t + 1.5)$ |
| 35. $f(x) = g(x - 1)$ | 36. $y = \cos\left(x - \frac{\pi}{2}\right)$ | 37. $y = \cos(x + \pi)$ |