

Practice 13-7

Translating Sine and Cosine Functions

Graph each function in the interval from 0 to 2π .

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| 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.

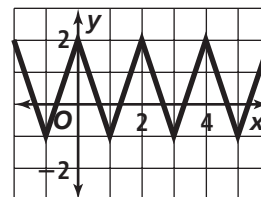
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|---|---|
| 16. $y = \sin x$, 2 units down | 17. $y = \cos x$, π units left |
| 18. $y = \cos x$, $\frac{\pi}{4}$ units up | 19. $y = \sin x$, 3.2 units to the right |

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.

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|--------------------|----------------|
| 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*).

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|-----------------------|--|-------------------------|
| 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. $y = \cos(x + \pi)$ |