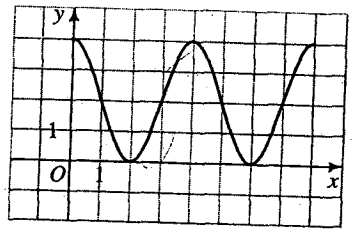
Give an equation for each trigonometric graph.

A 1.



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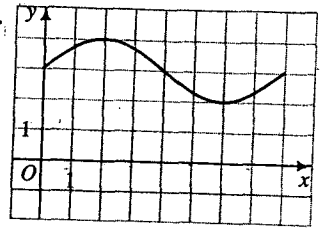

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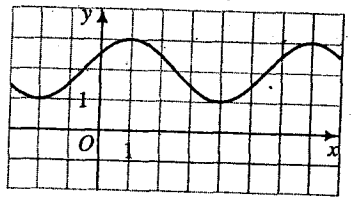

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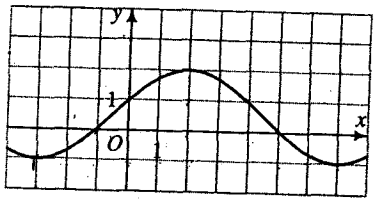

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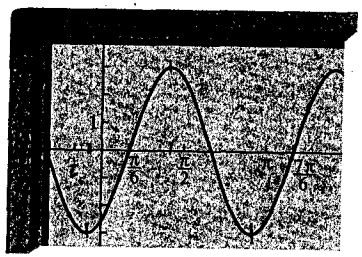

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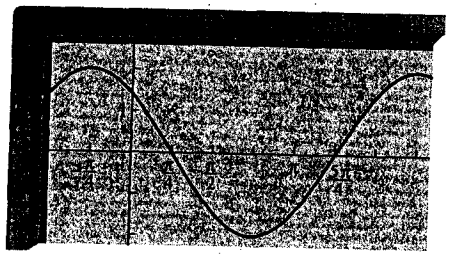

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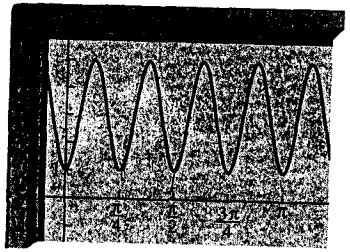

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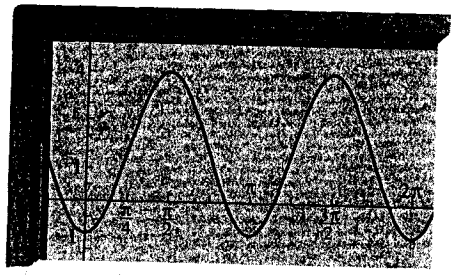


Sketch the graph of each equation.

9. $y = 3 + 5 \sin 2x$

10. $y = -2 + 2 \cos \frac{1}{2}x$

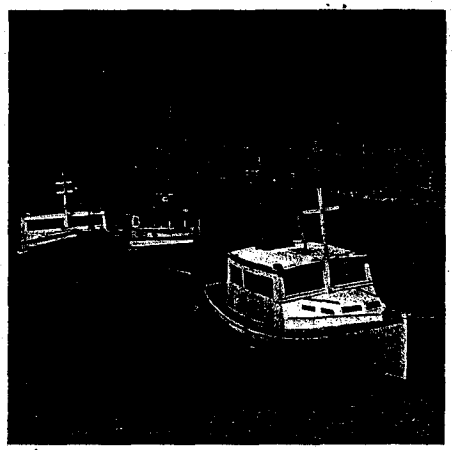
11. $y = -3 \sin\left(x - \frac{\pi}{6}\right)$

12. $y = 4 - 4 \cos 2(x - \pi)$

13. $y - 3 = 2 \cos \frac{\pi}{2}(x - 1)$

14. $y + 3 = 6 \sin \frac{\pi}{4}(x + 2)$

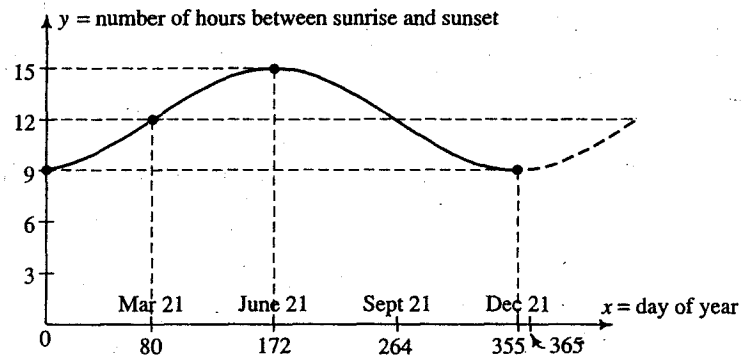
15. **Oceanography** The Bay of Fundy is an inlet of the Atlantic Ocean bounded by Maine and New Brunswick on the north and Nova Scotia on the south. It is famous for its high tides. At a dock there, the depth of water is 2 ft at low tide and 58 ft at high tide, which occurs 6 h 12 min after low tide. Draw a graph showing the depth of water at the dock as a function of the time since high tide occurs. Find an equation of your graph.



16. **Oceanography** Rework the tide problem in Example 2 assuming that the first high tide today occurs at 3:00 A.M. with a depth of 4.0 m, and the first low tide occurs at 9:24 A.M. with a depth of 1.8 m.

For some parts of the following exercises, you may wish to use a graphing calculator or a computer. Be sure to use radian measure.

B 17. **Astronomy** The approximate number of hours between sunrise and sunset in Denver, Colorado, varies throughout the year as shown in the graph. This variation is approximated by the sine wave shown below.



a. Give the period, amplitude, and equation of the daylight-hours graph.

b. Find the amount of daylight in Denver on January 1 and on July 4.

c. Over the course of a year, during what period of time is the amount of daylight in Denver at least 14 hours?

d. If you were to draw a daylight-hours graph for Seattle, Washington, which is north of Denver, do you think its amplitude would be less than or greater than that for the Denver curve?

18. **Astronomy** The graph given in Exercise 17 applies to Denver and to all other locations at latitude 39°44′N. Modify the graph for a location at 39°44′S. Give an equation of your modified graph.

A For Exercises 1–4, sketch and label the graphs given on a single set of axes.

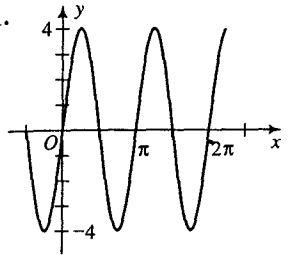
1. $y = \cos x,\ y = 3\cos x,\ y = \frac{1}{3}\cos x$
2. $y = \sin x,\ y = 4\sin x,\ y = -4\sin x$
3. $y = \sin x,\ y = \sin \frac{1}{2}x$
4. $y = \cos x,\ y = \cos 3x$

Give the amplitude and period of each function. Then sketch its graph.

5. $y = 2\sin 3x$
6. $y = 4\cos 2x$
7. $y = -2\cos 2t$
8. $y = -4\sin \frac{t}{3}$
9. $y = \frac{1}{2}\cos 2\pi t$
10. $y = 1.5\sin \frac{\pi}{2}x$

Give the amplitude, period, and an equation for each curve.

11.



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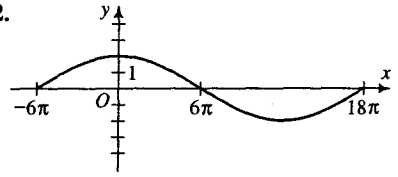

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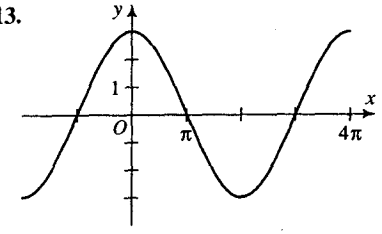

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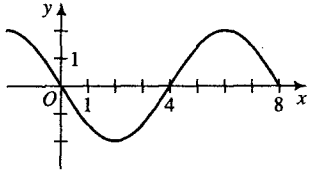

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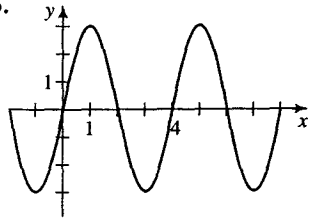

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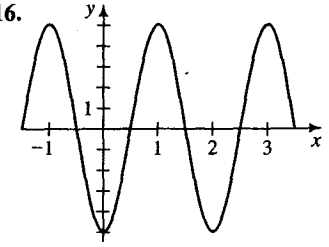

Give an equation for each trigonometric graph.

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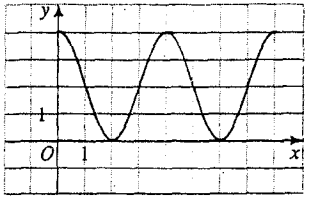

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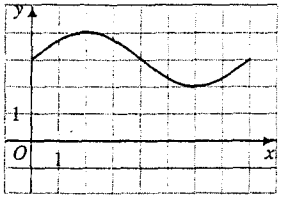

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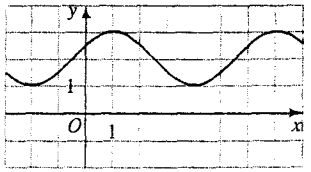

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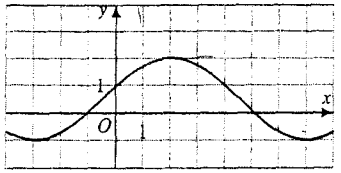

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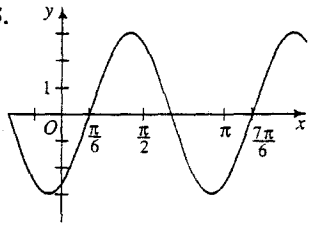

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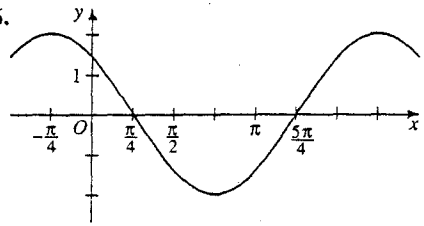

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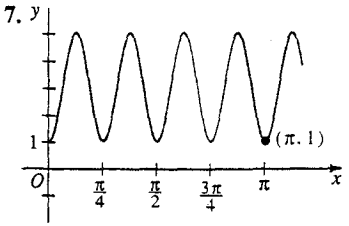

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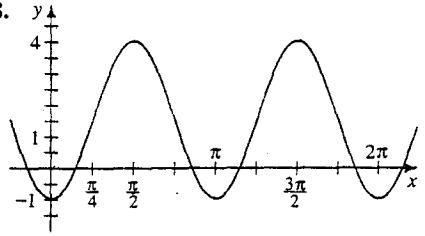

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