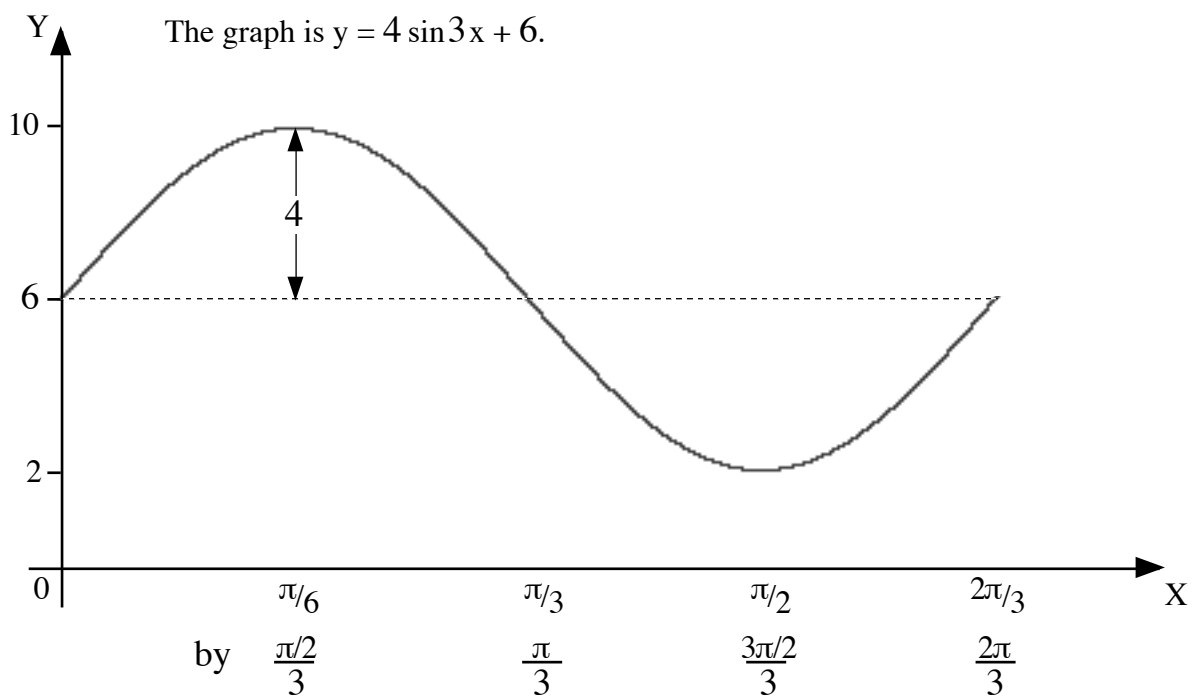
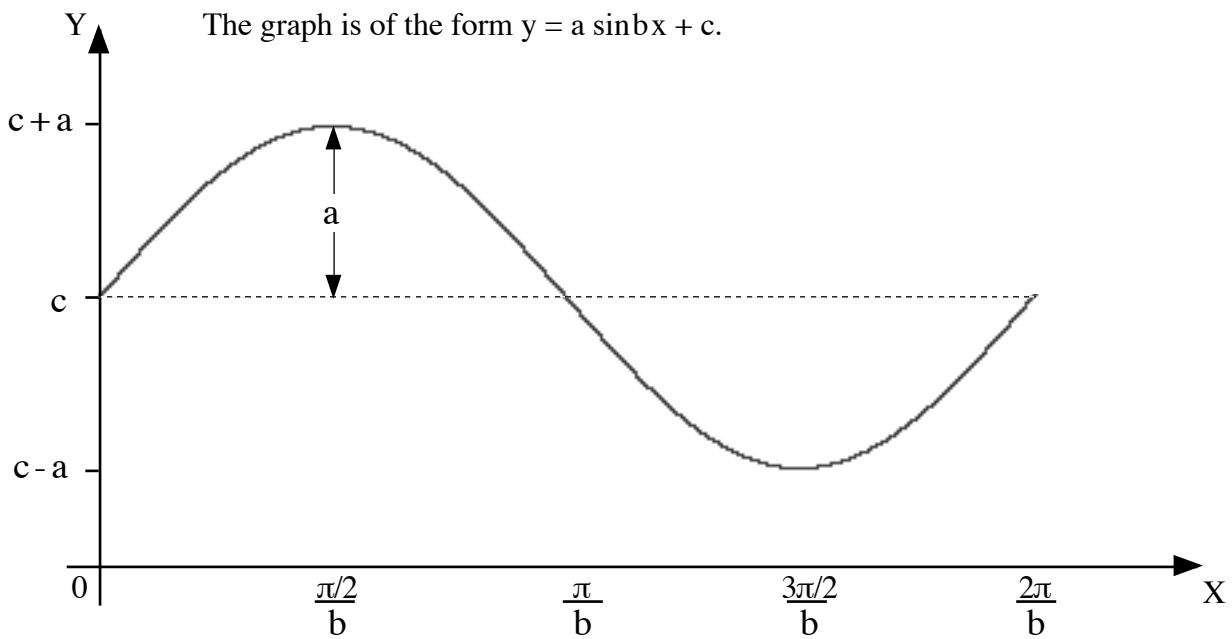


TRIG. GRAPHS: maximum and minimum values

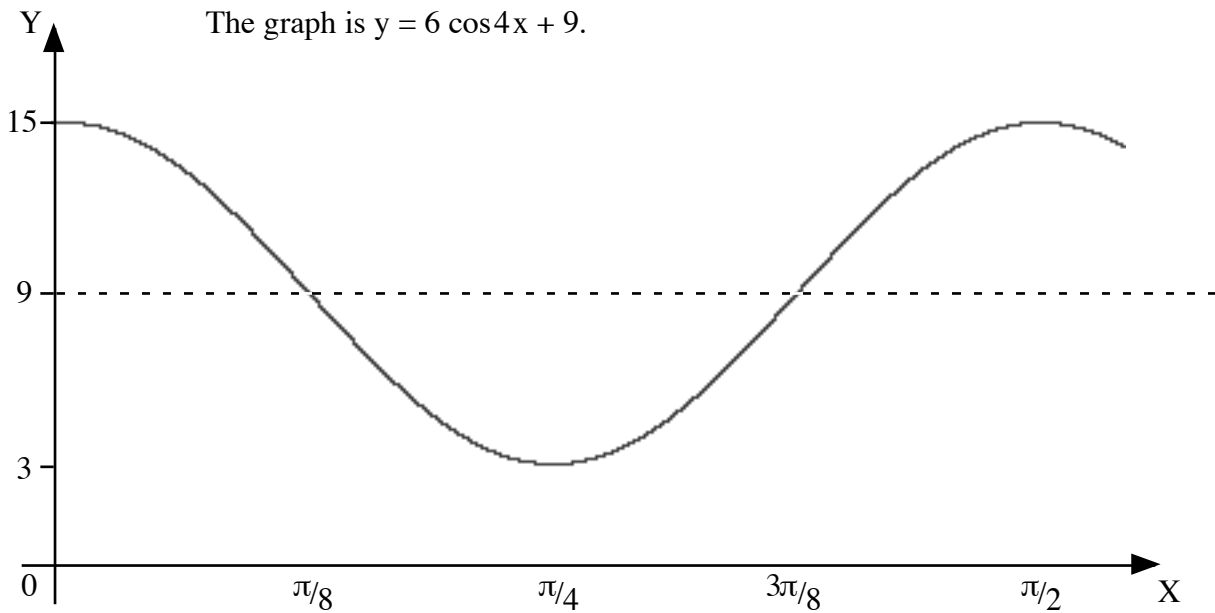


MAXIMUM $4 \times 1 + 6 = 10$ when $3x = \frac{\pi}{2}$
 $x = \frac{\pi}{6}$

MINIMUM $4 \times (-1) + 6 = 2$ when $3x = \frac{3\pi}{2}$
 $x = \frac{\pi}{2}$

maximum value 10 when $x = \frac{\pi}{6}$ or maximum turning point $(\frac{\pi}{6}, 10)$

minimum value 2 when $x = \frac{\pi}{2}$ or minimum turning point $(\frac{\pi}{2}, 2)$



MAXIMUM $6 \times 1 + 9 = 15$ when $4x = 0$ or 2π
 $x = 0$ or $\pi/2$

MINIMUM $6 \times (-1) + 9 = 3$ when $4x = \pi$
 $x = \pi/4$

maximum turning points $(0, 15)$, $(\pi/2, 15)$

minimum turning point $(\pi/4, 3)$

The maximum and minimum values of the expression

$$5 \sin(4t - \pi/3) + 7$$

and the corresponding values of t .

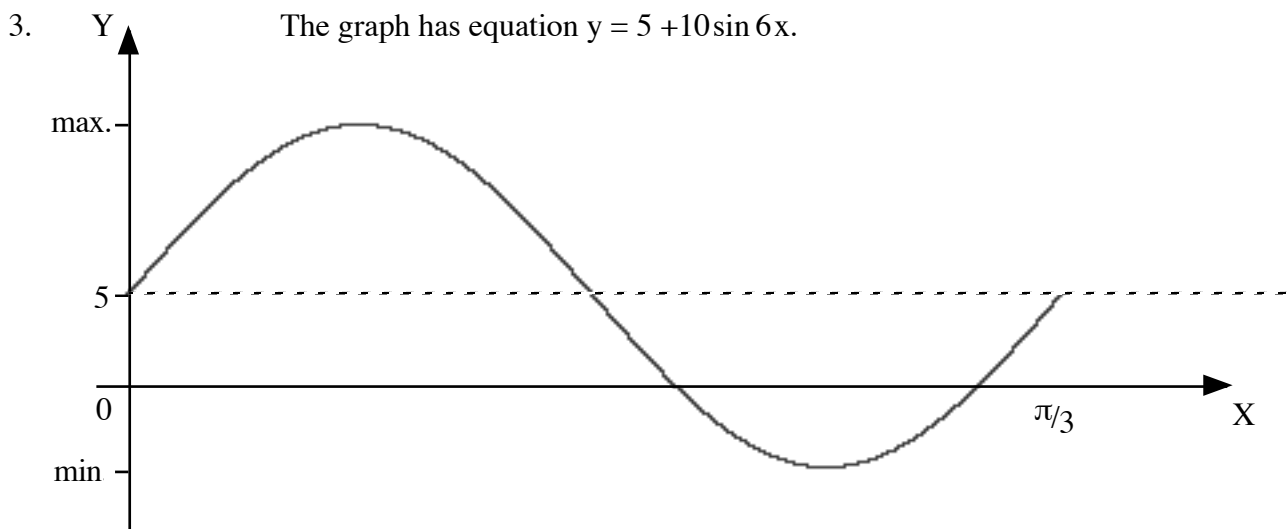
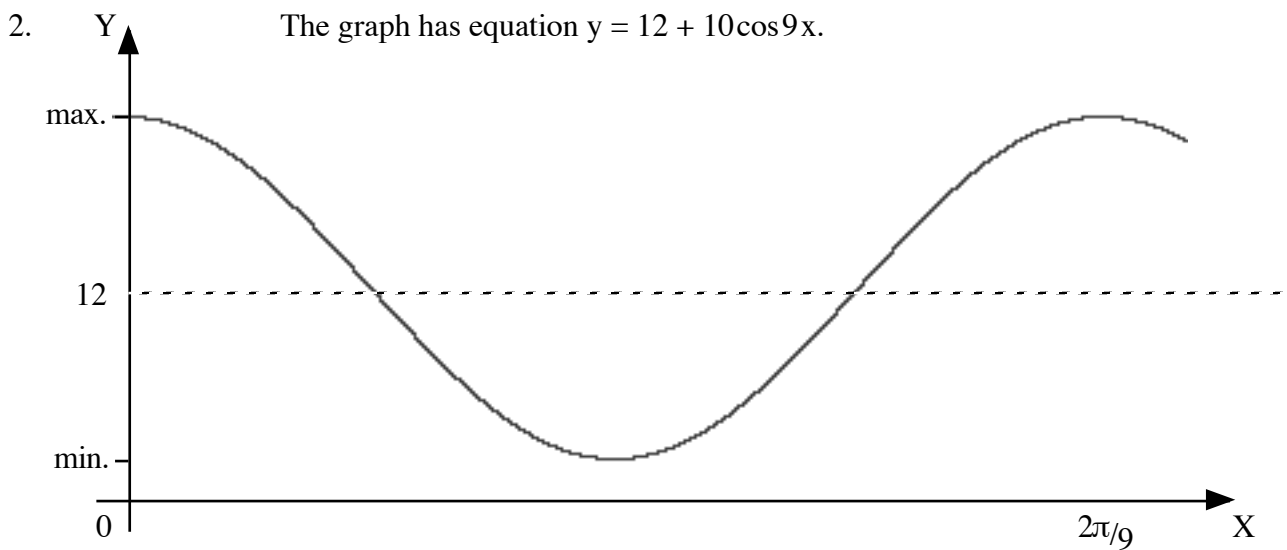
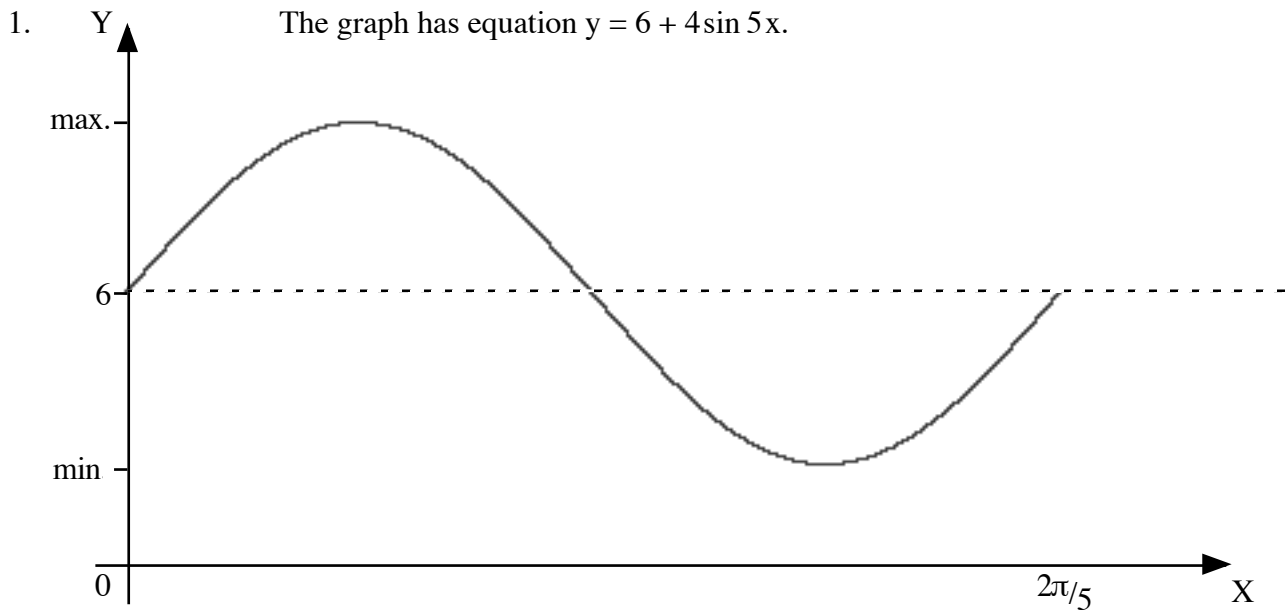
MAXIMUM $5 \times 1 + 7 = 12$ when $4t - \pi/3 = \pi/2$
 $4t = 5\pi/6$
 $t = 5\pi/24$

MINIMUM $5 \times (-1) + 7 = 2$ when $4t - \pi/3 = 3\pi/2$
 $4t = 11\pi/6$
 $t = 11\pi/24$

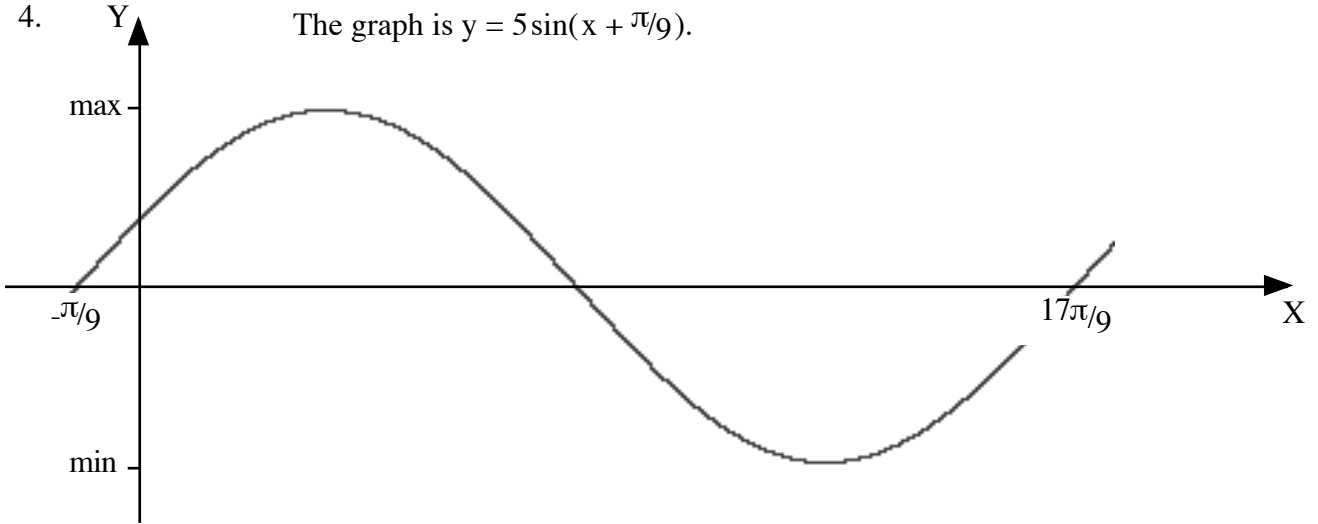
maximum value 12 when $t = 5\pi/24$

minimum value 2 when $t = 11\pi/24$

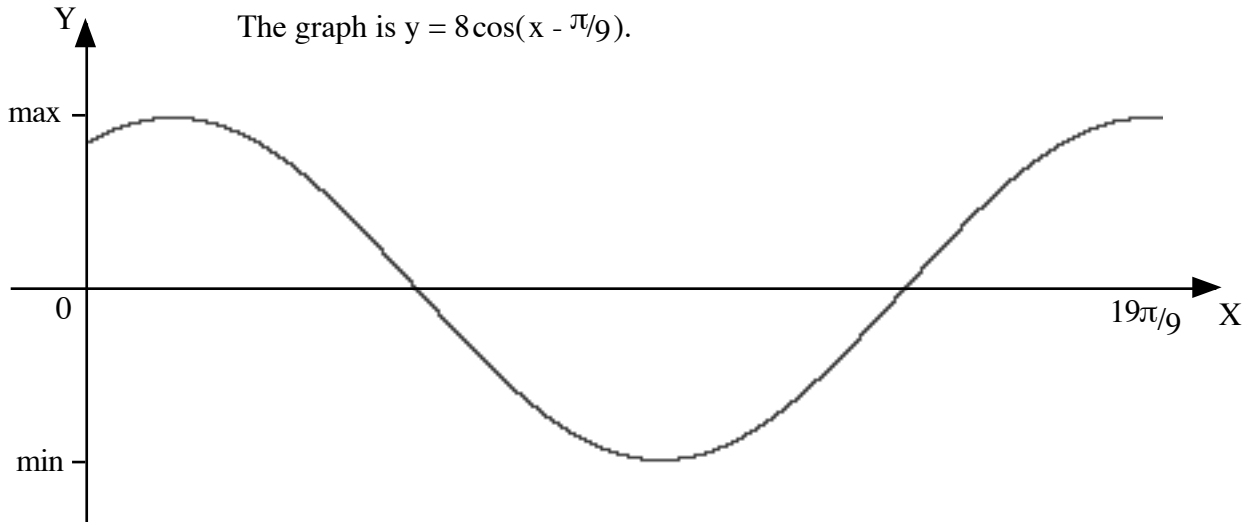
Find the coordinates of the maximum and minimum turning points of the graph.



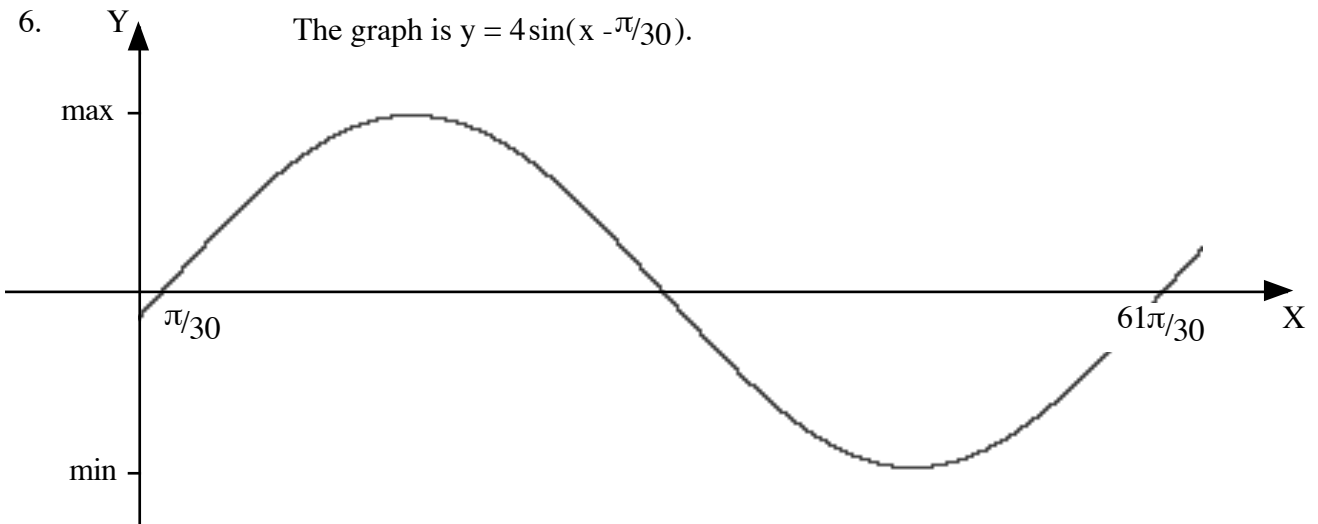
4. The graph is $y = 5 \sin(x + \pi/9)$.

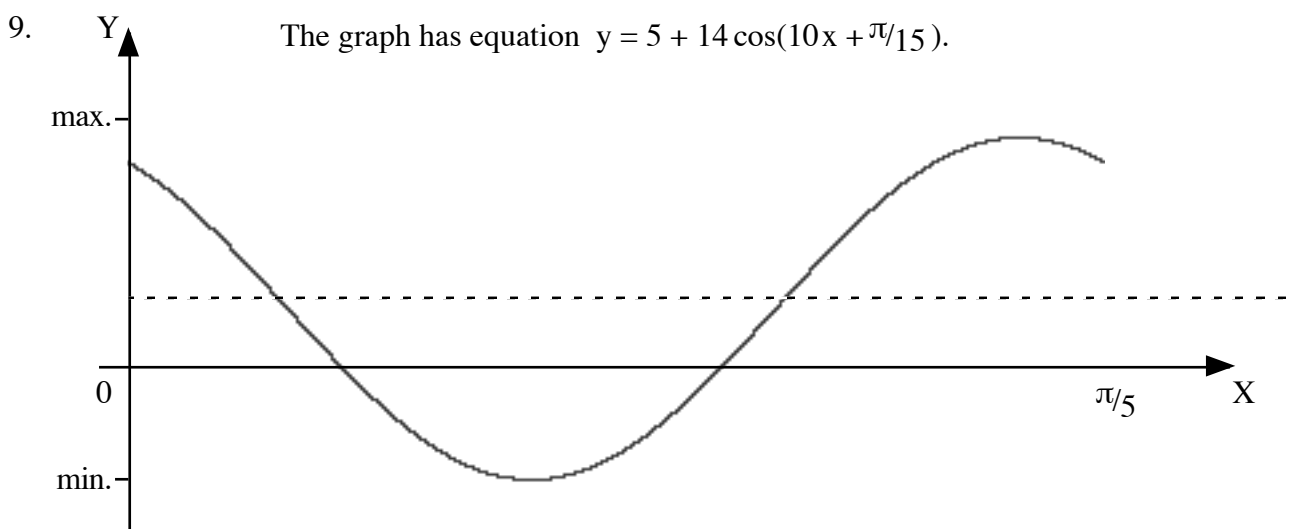
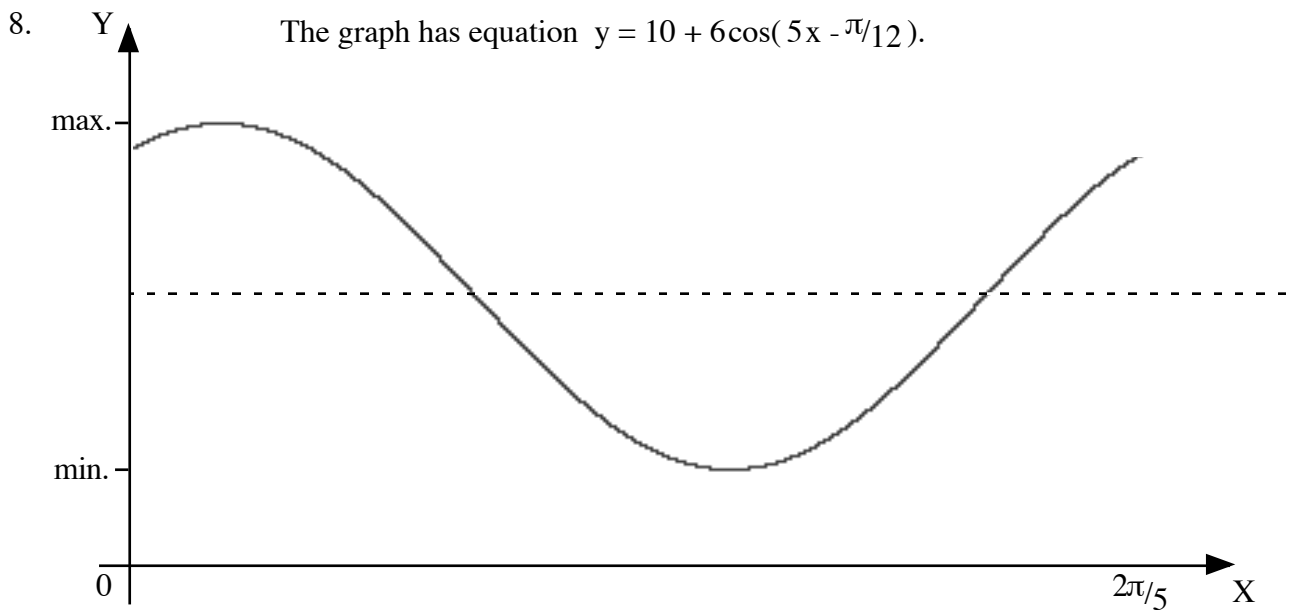
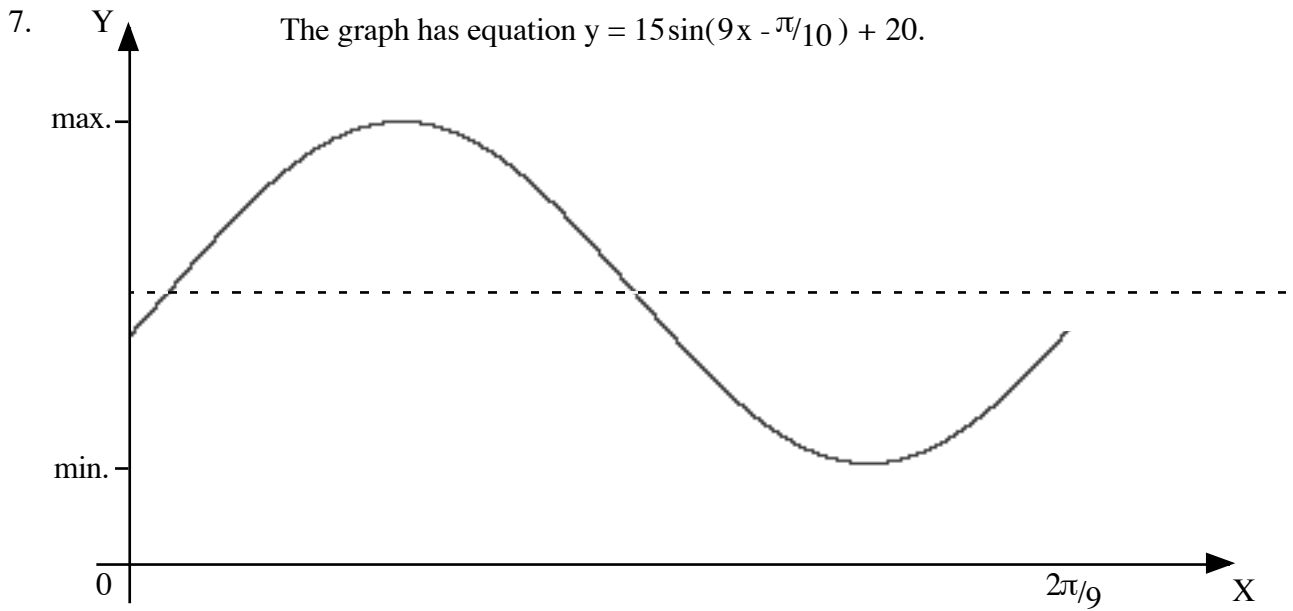


5. The graph is $y = 8 \cos(x - \pi/9)$.

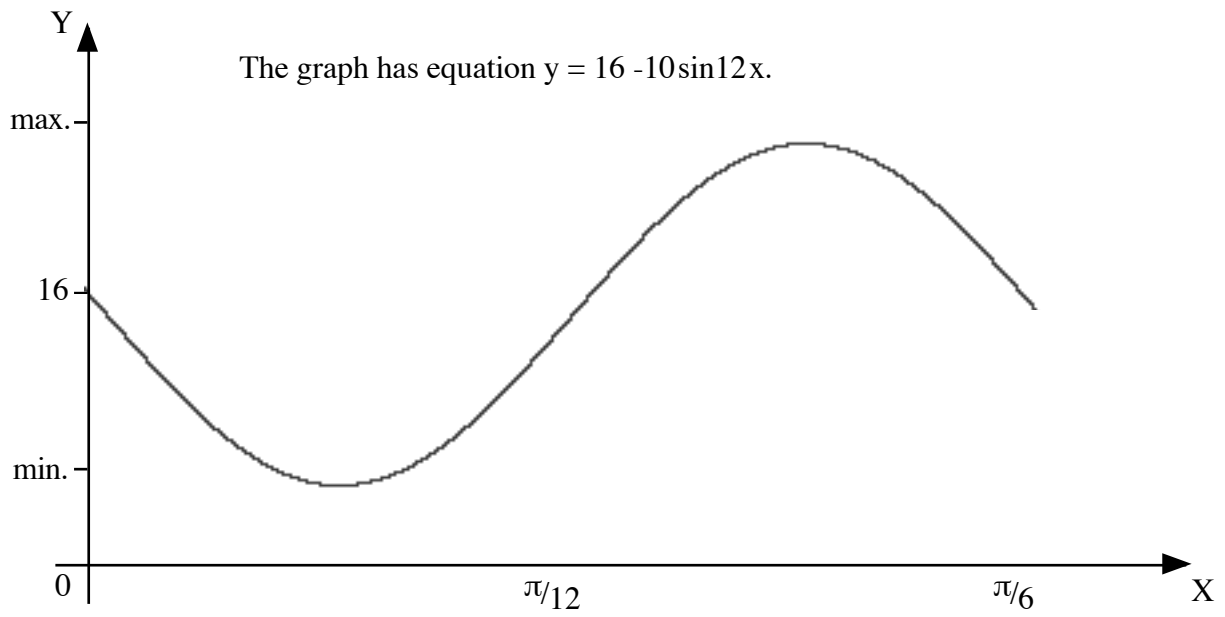


6. The graph is $y = 4 \sin(x - \pi/30)$.

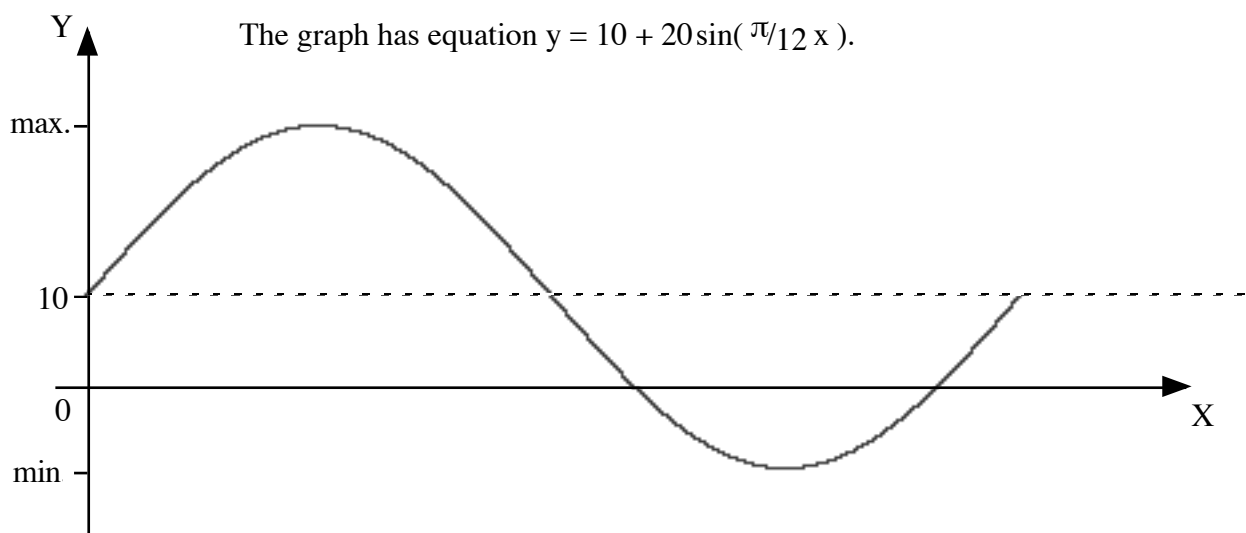




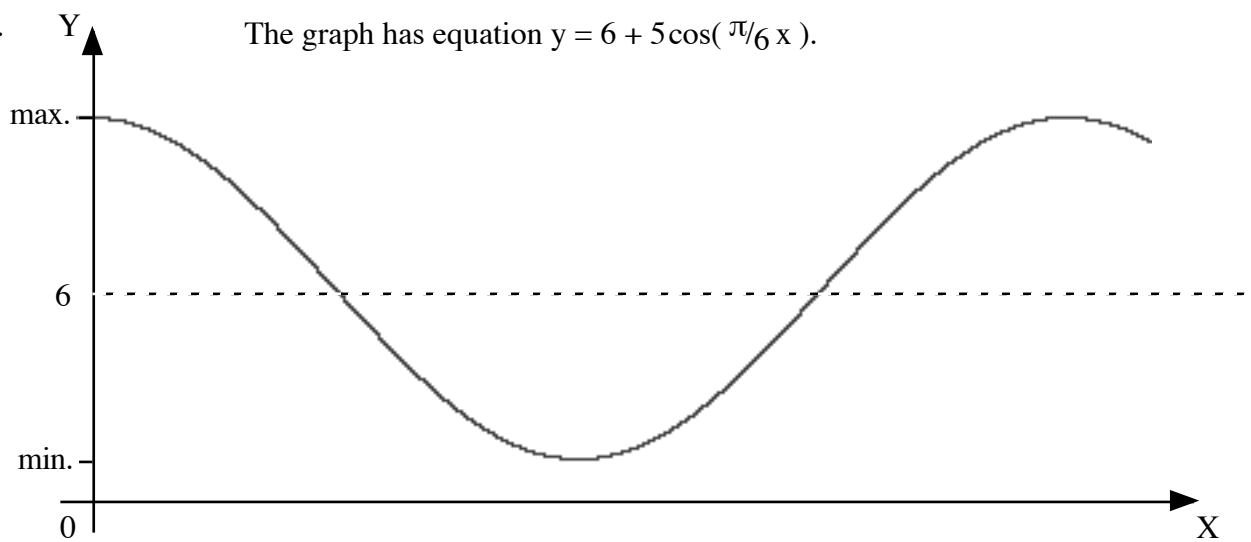
10.



11.



12.



Answers

- | | | | |
|--------------------------|---------------------|-----------------------|----------------------|
| 1. $\max(\pi/10, 10)$ | $\min(3\pi/10, 2)$ | 2. $\max(0, 22)$ | $\min(\pi/9, 2)$ |
| 3. $\max(\pi/12, 15)$ | $\min(\pi/4, -5)$ | 4. $\max(7\pi/18, 5)$ | $\min(25\pi/18, -5)$ |
| 5. $\max(\pi/9, 8)$ | $\min(10\pi/9, 8)$ | 6. $\max(8\pi/15, 4)$ | $\min(23\pi/15, -4)$ |
| 7. $\max(\pi/15, 35)$ | $\min(8\pi/45, 5)$ | 8. $\max(\pi/60, 16)$ | $\min(13\pi/60, 4)$ |
| 9. $\max(29\pi/150, 19)$ | $\min(7\pi/75, -9)$ | 10. $\max(\pi/8, 26)$ | $\min(\pi/24, 6)$ |
| 11. $\max(6, 30)$ | $\min(18, -10)$ | 12. $\max(0, 11)$ | $\min(6, 1)$ |