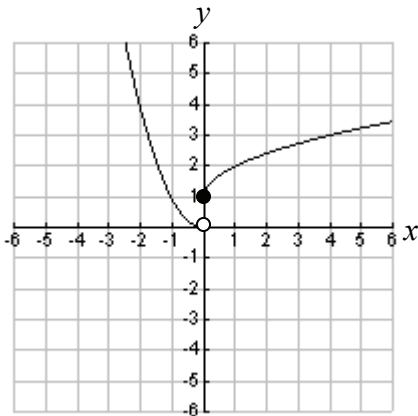
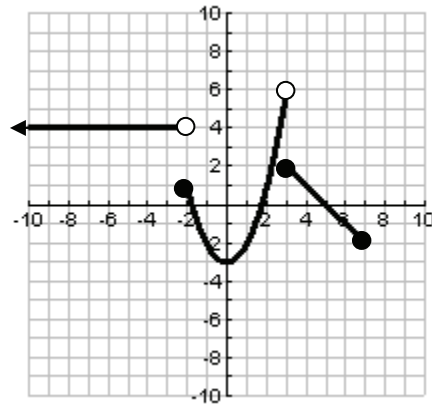


1.



2. **B**

3.



4. a. jump  
 b. infinite  
 c. removable

5. a.  $\lim_{x \rightarrow 4^+} f(x) = 8$

b.  $\lim_{x \rightarrow 4^+} f(x) = c$ , where  $c$  is any number except 8.

6. **B**

7. a. odd  
 b. even  
 c. even  
 d. even

8. C

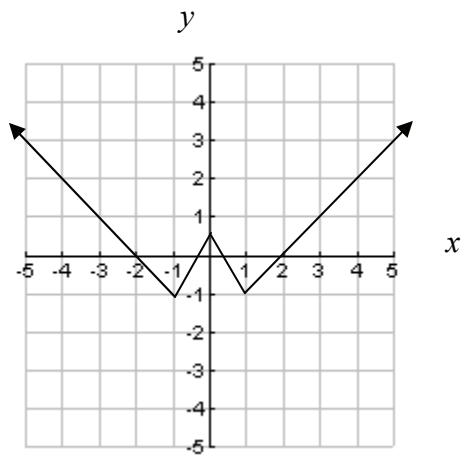
9. Domain:  $[-6,1) \cup (1,4]$  Range:  $[-2,7]$

10. a.  $f^{-1}(x) = x^2 - 2, x \geq 0$

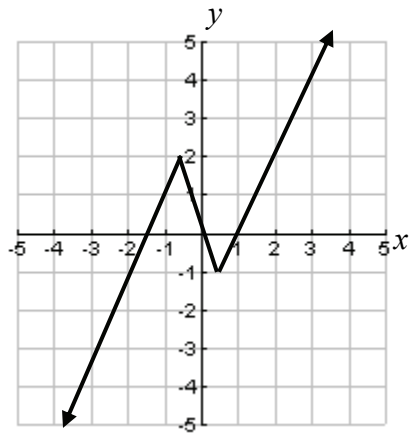
b.  $f^{-1}(x) = \sqrt[3]{x-4}$

c.  $f^{-1}(x) = \frac{2x+4}{x-1}$

11. a.



b.

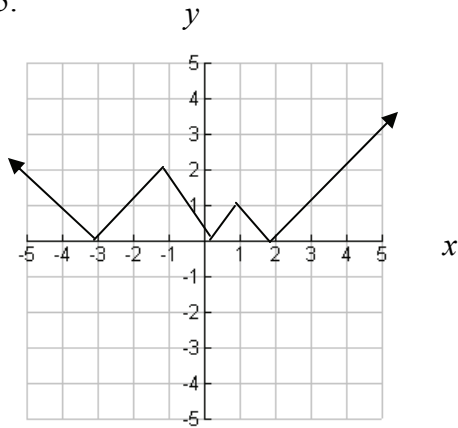


12. B, C, A, D

13. a. true  
b. false

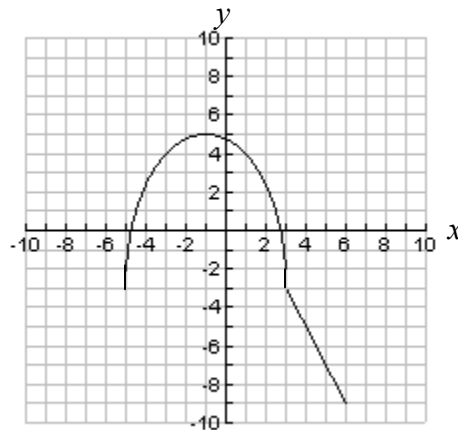
14. A

15.



16. a. Stretch vertically by a factor of 2, translate 1 unit right and 3 units down

b.



c. Domain:  $-5 \leq x \leq 6$

d. Range:  $-9 \leq y \leq 5$

17. B

18. a.  $y = \pm\sqrt{17}, \pm 4, \pm 3$

b. No, as shown above there are two values of  $y$  for certain values of  $x$  in the domain.

c.  $y = \pm\sqrt{17-x}$

19.

$$\sin \theta = \frac{y}{r} \quad \cos \theta = \frac{x}{r} \quad \tan \theta = \frac{y}{x}$$

$$\cot \theta = \frac{x}{y} \quad \sec \theta = \frac{r}{x} \quad \csc \theta = \frac{r}{y}$$

20.  $\cos \theta = \frac{3}{5}, \tan \theta = -\frac{4}{3}, \cot \theta = -\frac{3}{4}, \sec \theta = \frac{5}{3}, \csc \theta = -\frac{5}{4}$

21. a. II

b. III

c. III

22. a.  $\frac{2\pi}{9}$

b.  $\frac{11\pi}{12}$

23. a.  $\sin \theta = 0.6$

b.  $\cos \theta = 0.8$

c.  $\tan \theta = \frac{3}{4}$

24.

a.  $\frac{1}{2}$

b.  $-\frac{1}{\sqrt{2}} = -\frac{\sqrt{2}}{2}$

c.  $-\sqrt{3}$

d.  $-1$

e.  $-1$

f. *undefined*

g. 1

h.  $-\frac{1}{2}$

i.  $\frac{1}{2}$

j.  $\frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$

k.  $-\frac{\sqrt{3}}{2}$

l.  $\frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

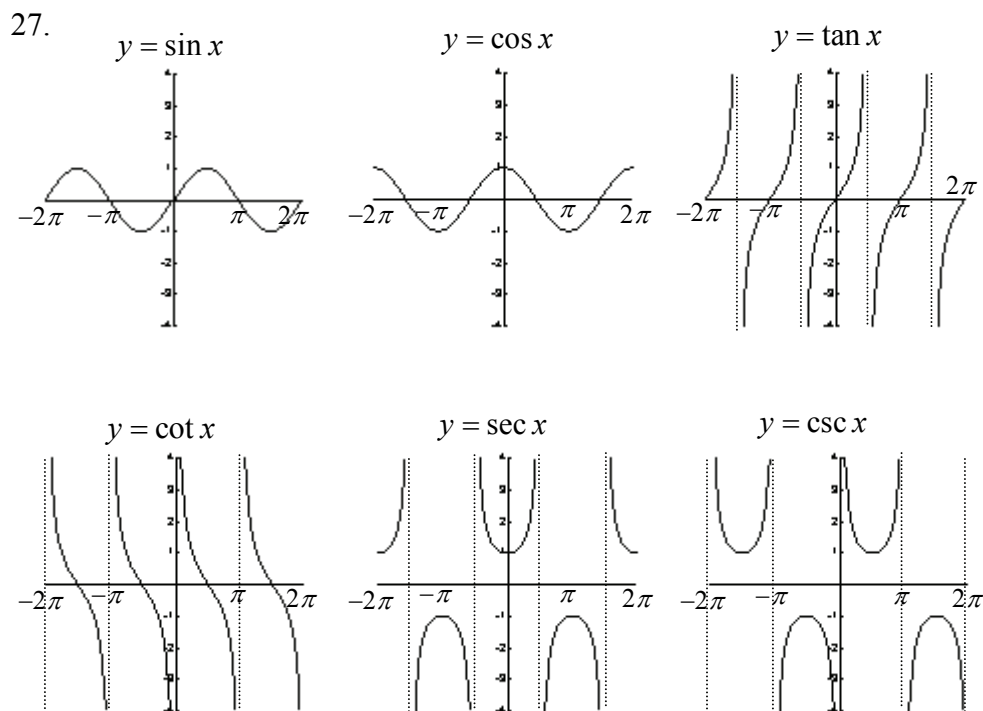
m.  $-\sqrt{2}$

n.  $-\sqrt{3}$

o.  $-\frac{2}{\sqrt{3}} = -\frac{2\sqrt{3}}{3}$

25. a.  $\frac{12}{13}$   
 b.  $-\frac{5}{13}$   
 c.  $-\frac{12}{5}$

26. yes – d, e, h and j  
 no – a, b, c, f, g and i



28. **B**

29. a. i.  $\tan^{-1}x$       ii.  $\sin^{-1}x$       iii.  $\cos^{-1}x$

b.

	$\sin^{-1}x$	$\cos^{-1}x$	$\tan^{-1}x$
Domain	$[-1, 1]$	$[-1, 1]$	$(-\infty, \infty)$
Range	$\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$	$[0, \pi]$	$\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

30.  $\lim_{x \rightarrow \infty} f(x) = \frac{\pi}{2}$ ,  $\lim_{x \rightarrow -\infty} f(x) = -\frac{\pi}{2}$

31.

a.  $\frac{\pi}{6}$

b.  $\frac{3\pi}{4}$

c.  $\frac{\pi}{3}$

d.  $-\frac{\pi}{2}$

e.  $\frac{\pi}{2}$

f.  $-\frac{\pi}{4}$

32.

a.  $\frac{1}{2}$

b.  $-\frac{\sqrt{2}}{2}$

c.  $-1$

33.

a.  $\frac{5}{8}$

b.  $\frac{12}{5}$

c.  $\frac{\pi}{6}$

d.  $-\frac{4}{5}$

34.

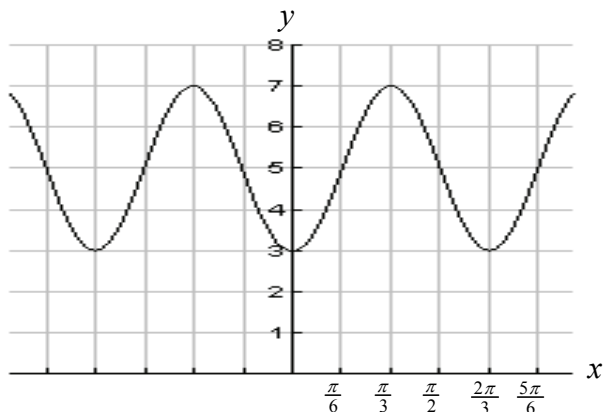
a.  $y = 2 \sin x + 5$

b.  $y = 3 \sin(\pi x)$

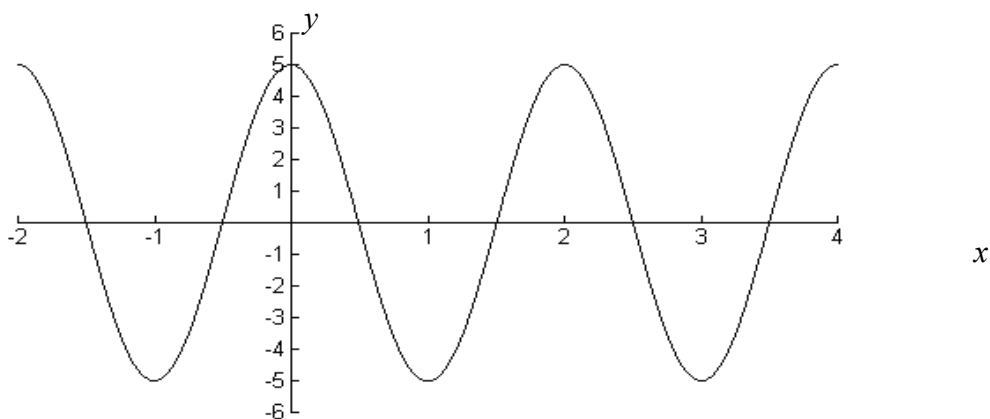
c.  $y = 4 \cos\left(x - \frac{\pi}{6}\right) - 2$

35.  $y = 3 \sin\left(\frac{\pi}{3}\left(x - \frac{\pi}{2}\right)\right)$

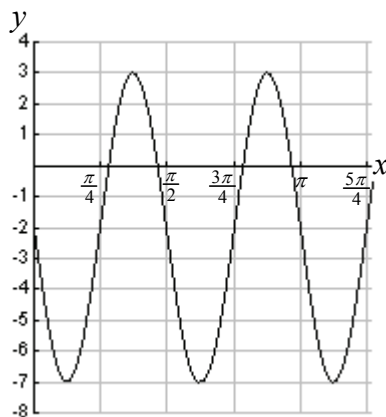
36a. amplitude 2, period  $\frac{2\pi}{3}$ , phase shift right  $\frac{\pi}{6}$ , vertical translation up 5



36b. amplitude 5, period 2, phase shift left 1, vertical translation 0



36c. Amplitude 5, period  $\frac{\pi}{2}$ , Phase shift  $\frac{\pi}{4}$  right, vertical translation down 2



37. **D**

38. a.  $\sin \frac{\pi}{4} = \frac{\sqrt{2}}{2}$

b.  $\cos \pi = -1$

39.

a.  $\sin 2A = 2 \sin A \cos A = 2 \left( \frac{5}{13} \right) \left( -\frac{12}{13} \right) = -\frac{120}{169}$

b.  $\cos 2A = \cos^2 A - \sin^2 A = \left( -\frac{12}{13} \right)^2 - \left( \frac{5}{13} \right)^2 = \frac{119}{169}$

40. a.  $\sin \left( \frac{\theta}{2} \right) = +\sqrt{\frac{1 - \left( -\frac{8}{17} \right)}{2}} = +\sqrt{\frac{\frac{25}{17}}{2}} = +\sqrt{\frac{25}{34}} = \frac{5}{\sqrt{34}}$

b.  $\cos \left( \frac{\theta}{2} \right) = -\sqrt{\frac{1 + \left( -\frac{8}{17} \right)}{2}} = -\sqrt{\frac{\frac{9}{17}}{2}} = -\sqrt{\frac{9}{34}} = -\frac{3}{\sqrt{34}}$

c.  $\tan \left( \frac{\theta}{2} \right) = \frac{1 - \left( -\frac{8}{17} \right)}{-\frac{15}{17}} = \frac{\frac{25}{17}}{-\frac{15}{17}} = -\frac{25}{15} = -\frac{5}{3}$

41.

a.  $\sin \theta \cot \theta = \sin \theta \cdot \frac{\cos \theta}{\sin \theta} = \cos \theta$

b.

$$(\sin x + \cos x)^2 = \sin^2 x + 2 \sin x \cos x + \cos^2 x = \sin^2 x + \cos^2 x + 2 \sin x \cos x = 1 + \sin 2x$$

c.  $\frac{\csc x}{1 + \cot^2 x} = \frac{\csc x}{\csc^2 x} = \frac{1}{\csc x} = \sin x$

d.  $\frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\sin \theta} = \frac{\sin^2 \theta}{\sin \theta \cos \theta} + \frac{\cos^2 \theta}{\sin \theta \cos \theta} = \frac{1}{\sin \theta \cos \theta} = \frac{1}{\cos \theta} \cdot \frac{1}{\sin \theta} = \sec \theta \csc \theta$

e.

$$\sin(x + y) + \sin(x - y) = \sin x \cos y + \cos y \sin x + \sin x \cos y - \cos y \sin x = 2 \sin x \cos y$$

$$f. \quad \sin^2 \theta + \sin^2 \theta \tan^2 \theta = \sin^2 \theta (1 + \tan^2 \theta) = \sin^2 \theta \sec^2 \theta = \frac{\sin^2 \theta}{\cos^2 \theta} = \tan^2 \theta$$

g.

$$\tan x + \cot x = \frac{\sin x}{\cos x} + \frac{\cos x}{\sin x} = \frac{\sin^2 x + \cos^2 x}{\cos x \sin x} = \frac{1}{\sin x \cos x} = \frac{2}{2 \sin x \cos x} = \frac{2}{\sin(2x)} = 2 \csc(2x)$$

$$h. \quad \frac{\cot \theta}{\cos \theta} + \frac{\sec \theta}{\cot \theta} = \frac{\cot^2 \theta + 1}{\cos \theta \cot \theta} = \frac{\csc^2 \theta}{\cos \theta \cdot \frac{\cos \theta}{\sin \theta}} = \frac{\csc^2 \theta \sin \theta}{\cos^2 \theta} = \sec^2 \theta \csc \theta$$

42. a.  $\theta = 225^\circ, 315^\circ$

b.  $\theta = 120^\circ, 240^\circ$

43. a.  $x = \frac{3\pi}{4}, \frac{7\pi}{4}$

b.  $x = \frac{\pi}{6}, \frac{\pi}{2}, \frac{5\pi}{6}$

c.  $x = \frac{7\pi}{12}, \frac{11\pi}{12}, \frac{19\pi}{12}, \frac{23\pi}{12}$

44. 1 triangle

45.  $1.68\pi \text{ m/s} \approx 5.278 \text{ m/s}$

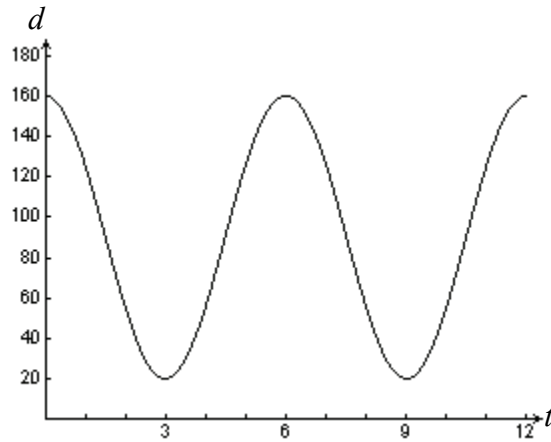
46. a.  $\frac{\pi}{40}$  radians per hour

b.  $733.333\pi \text{ fps} \approx 2303.835 \text{ fps}$

47.

Radius	Angle(Radians)	Arc Length
6 inches	$\frac{\pi}{4}$	$\frac{3\pi}{2}$ inches
18 feet	$\frac{5\pi}{6}$	$15\pi$ feet
10 meters	3	30 meters

48. a.



b.  $d = 70 \cos\left(\frac{\pi}{3}t\right) + 90$

c. 125 cm

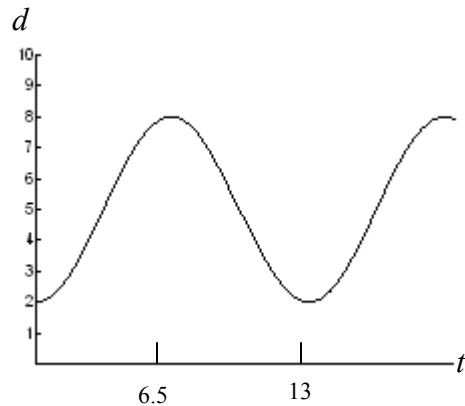
d. 2.260 s

49. a.  $h(t) = 30 \cos\left(\frac{\pi}{4}(t-3)\right) + 50$  (other answers are acceptable)

b.  $h(11.5) = 77.716$  ft

c. 1.929 sec, 4.071 sec

50. a.



b.  $d(t) = 5 - 3 \cos\left(\frac{2\pi}{13}t\right)$

c.  $t \approx 1.740$  hours after midnight (approximately 1:44 a.m.)

51. a.  $131.8^\circ, 228.2^\circ$   
b.  $199.5^\circ, 340.5^\circ$
52. no triangles
53. 16.915
54.  $47.9^\circ$
55.  $m\angle B = 72.2^\circ, m\angle C = 49.8^\circ, c = 10.3$  and  
 $m\angle B = 107.8^\circ, m\angle C = 14.2^\circ, c = 3.3$
56. 285.630 ft
57. 643.470 ft
58. 7391.462 ft
59. 31.114 ft
60. 5.698 miles
61. a. 10  
b. 105.3
62. a. 17,658.952 sq. ft.  
b. \$22,702
63.  $\angle A = 36.9^\circ$  or  $143.1^\circ$
64. 32.361 meters