1. $-2x(x+3)-(x+1)(x-2)=$
   a. $-x^2-7x-2$.
   b. $-x^2+5x+2$.
   c. $-3x^2-7x+2$.
   d. $-3x^2-5x+2$.
   e. $-3x^2+5x-2$.

2. $\dfrac{x}{x+2}-\dfrac{7}{x-2}=$
   a. $\dfrac{x-7}{x+2}$.
   b. $\dfrac{x+7}{x+2}$.
   c. $\dfrac{x^2-9x-14}{x^2-4}$.
   d. $\dfrac{x^2-9x+14}{x^2-4}$.
   e. $\dfrac{x-7}{4}$.

3. $\sqrt[3]{x^2}=$
   a. $x^{\frac{2}{3}}$. b. x^{-3}. c. $x^{\frac{3}{2}}$. d. x^{-6}. e. x^6.

4. $\dfrac{5^{-2}x^{-1}}{x^4y^2}=$
   a. $\dfrac{1}{25x^3y^2}$.
   b. $\dfrac{1}{10x^5y^2}$.
   c. $\dfrac{25x^5}{y^2}$.
   d. $\dfrac{10}{x^3y^2}$.
   e. $\dfrac{1}{25x^5y^2}$.

5. $(64)^{-\frac{1}{2}} =$

a. 8. b. -4. c. $-\frac{1}{8}$. d. $\frac{1}{8}$. e. $\frac{1}{4}$.

6. If $\sqrt[3]{x}+a=b$, then $x=$

a. $(b-a)^3$.
b. $(a-b)^3$.
c. b^3-a^3.
d. a^3-b^3.
e. $\sqrt[3]{b-a}$.

7. $\dfrac{\frac{1}{x}-\frac{1}{y}}{y^2-x^2} =$

a. $xy(x+y)$.
b. $\dfrac{1}{xy(x+y)}$.
c. $\dfrac{1}{-(x^3+y^3)}$.
d. $y-x$.
e. $\dfrac{1}{x+y}$.

8. $|2x+7| \le 1$ is equivalent to which of the following?

a. $x \le -3$
b. $x \le 3$
c. $3 \le x \le 4$
d. $-4 \le x \le -3$
e. $0 \le x \le 3$

9. $a^{\frac{2}{3}} \cdot a^{\frac{1}{4}} =$

a. $a^{\frac{1}{6}}$. b. $a^{\frac{2}{7}}$. c. $a^{\frac{11}{12}}$. d. $a^{\frac{1}{4}}$. e. $a^{\frac{3}{7}}$.

10. In the figure below, if the length of AB is 10, find the length of AD.

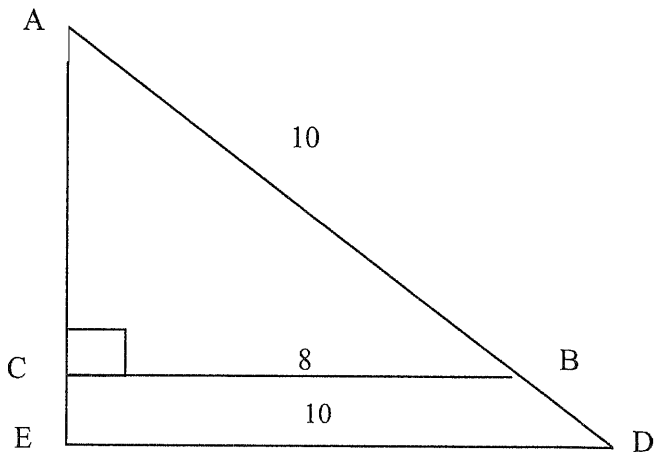
a. $11\frac{3}{8}$

b. $11\frac{3}{4}$

c. 12

d. $12\frac{1}{4}$

e. $12\frac{1}{2}$



11. One solution of the equation $x^2+7x-2=0$ is

a. $\frac{7+\sqrt{41}}{2}$.

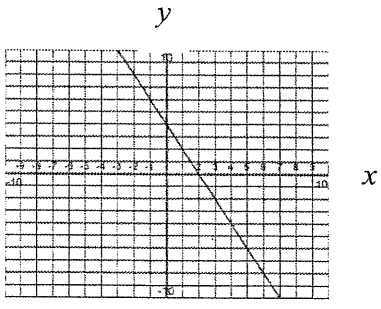
b. $\frac{7-\sqrt{41}}{2}$.

c. $\frac{7+\sqrt{57}}{2}$.

d. $\frac{-7+\sqrt{41}}{2}$.

e. $\frac{-7-\sqrt{57}}{2}$.

12. What is the slope of the line shown? You may assume that each tick mark represents one unit.



a. -2 b. $-\frac{1}{2}$ c. 1 d. 2 e. $\frac{1}{2}$

13. If $f(x)=4x-2$, then $f(x-1)=$

a. $4x^2-6x+2$.
b. $4x^2+2x+2$.
c. $4x+2$.
d. $4x-6$.
e. $4x-1$.

14. The graph of which of the following equations is a line parallel to the graph of $x-5y=8$?

a. $x+5y=8$
b. $5x-y=8$
c. $2x+10y=8$
d. $2x-10y=8$
e. $10x-2y=8$

15. If $z=\dfrac{x-8}{2x}$, then $x=$

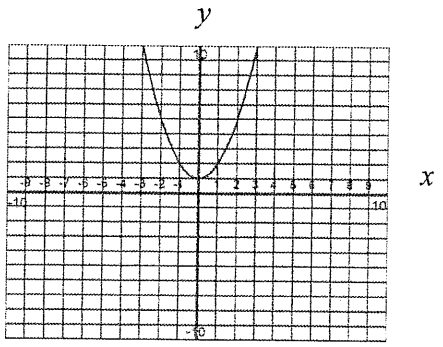
a. $\dfrac{8}{1-2z}$.
b. $\dfrac{8}{2z-1}$.
c. $\dfrac{z-8}{2}$.
d. $\dfrac{z+8}{2}$.
e. $2z-1$.

16. If $\sqrt{x+b}=a$, then $x=$

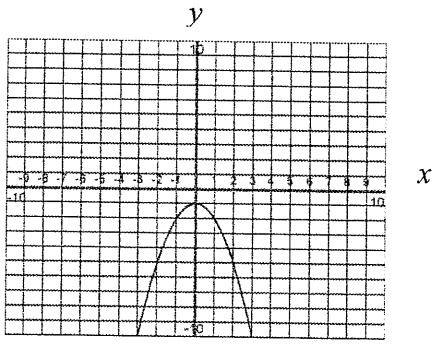
a. $a-b^2$.
b. $a-\sqrt{b}$.
c. a^2-b.
d. a^2+b.
e. $a+\sqrt{b}$.

17. Which of the following could represent the graph of $y = -x^2 - 1$? You may assume that each tick mark represents one unit.

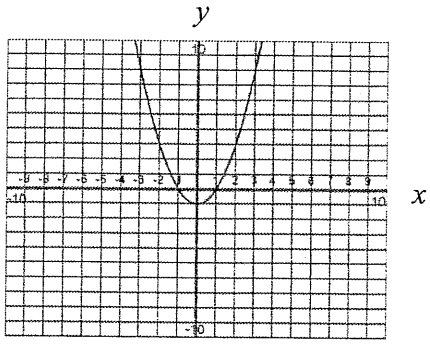
a.



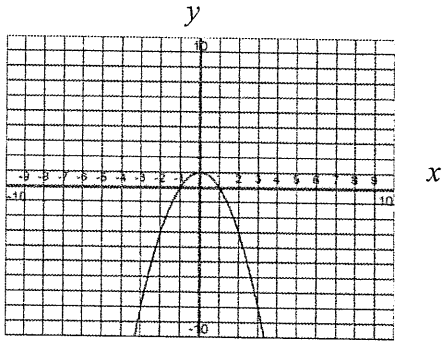
b.



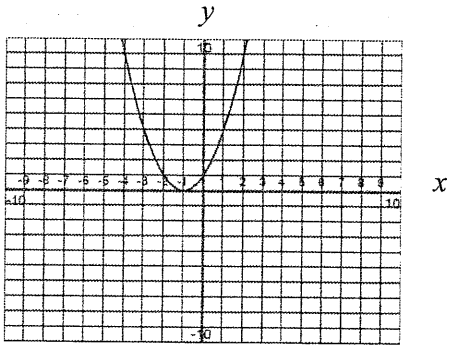
c.



d.



e.

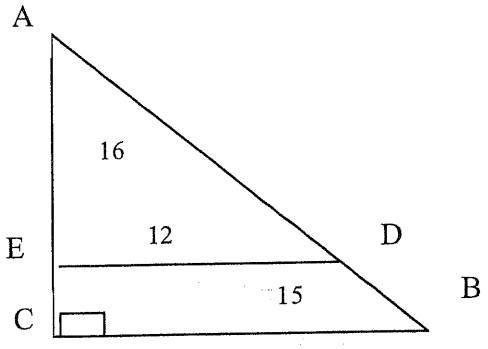


18. If $\frac{1}{r+s}=\frac{1}{t}$, then $s=$

a. $t-r$.
b. $r-t$.
c. $\frac{rt}{t-r}$.
d. $\frac{rt}{r-t}$.
e. $\frac{1}{t-r}$.

19. In the figure below, if the length of $AE=16$, find the length of EC.

a. 21
b. $5\frac{2}{3}$
c. 5
d. $4\frac{1}{2}$
e. 4



20. The graph of $\frac{(x-2)^2}{16}-\frac{(y-1)^2}{25}=1$ is which of the following?

a. circle
b. ellipse
c. hyperbola
d. parabola
e. two intersecting lines

21. A parent rewards a child with 50 cents for each correctly solved mathematics problem and fines the child 30 cents for each incorrectly solved problem. If the child nets $22.00 after 100 problems. How many problems were solved correctly?

a. 30 b. 35 c. 45 d. 53 e. 65

22. If $3^{x+5}=\frac{1}{27}$, then $x=$

a. -10. b. -8. c. -6. d. -2. e. 1.

23. If $x \geq 0$, then $\sqrt{x^4 - 6x^2 + 9} =$

a. $x^2 - \sqrt{6x} + 3$.
b. $x^2 + \sqrt{6x} + 3$.
c. $|x^2 - 3|$.
d. $(x^2 + 3)\sqrt{-6x^2}$.
e. $x^2\sqrt{6x+9}$.

24. If $\log_3 81 = x$, then $x =$

a. 2.
b. 4.
c. 6.
d. 12.
e. 27.

25. If $\log_2\left(\frac{1}{128}\right) = x$, then $x =$

a. –7.
b. $\frac{1}{7}$.
c. $-\frac{1}{7}$.
d. 7.
e. 64.

26. If $\log 5 = 0.6990$ and $\log 3 = 0.4771$, then $\log 45 =$

a. 0.93755.
b. 0.58881.
c. 2.3524.
d. 2.1303.
e. 1.6532.

27. If $\log x = 3\log a + \log b$, then $x =$

a. $(ab)^3$.
b. $3a + b$.
c. $3ab$.
d. a^3b.
e. $\frac{a^3}{b}$.

28. If $2^{1.5894} = 3$, then $2^{4.5894} =$

a. 18. b. 24. c. 28. d. 30. e. 31.

29. Given that $\log_b\left(N^4\right) = 8$, then $\log_b\left(\frac{1}{N}\right) =$

a. -2.
b. $\frac{1}{2}$.
c. $\sqrt[4]{8}$.
d. $\frac{1}{\sqrt[4]{8}}$.
e. $-\frac{1}{2}$.

30. Given that a circle has 2π radians, how many degrees are equal to $\frac{\pi}{12}$ radians?

a. 6°
b. 12°
c. 15°
d. 20°
e. 30°

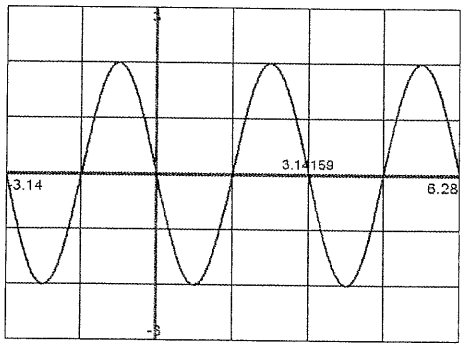
31. If $\cos 60^\circ = \frac{1}{2}$, then $\cos 300^\circ =$

a. $\frac{\sqrt{3}}{2}$.
b. $-\frac{1}{2}$.
c. $\frac{\sqrt{2}}{2}$.
d. $-\frac{\sqrt{3}}{2}$.
e. $\frac{1}{2}$.

32. If $\tan\theta = \frac{5}{12}$, $0^\circ \le \theta \le 90^\circ$, then $\cos\theta =$

a. $\frac{5}{13}$. b. $\frac{12}{13}$. c. $\frac{13}{5}$. d. $\frac{13}{12}$. e. $\frac{12}{5}$.

33. The figure below shows a portion of the graph of which of the following functions? Note that the x-axis is labeled in radians. Each tick mark on the y-axis is one unit.



a. $y = 2\sin\left(\frac{x}{2}\right)$

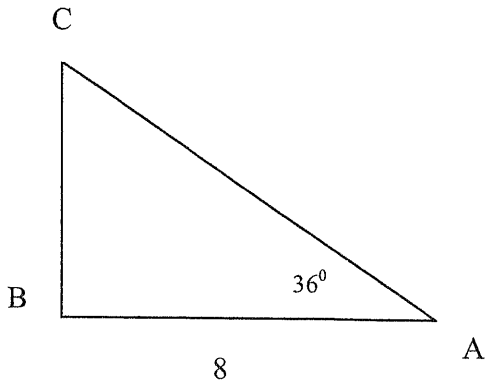
b. $y = -2\cos(2x)$

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

d. $y = -2\sin(2x)$

e. $y = 2\cos(2x)$

34. In the figure below, the length of BC is



a. $8\sin 36^\circ$.

b. $8\cos 36^\circ$.

c. $8\tan 36^\circ$.

d. 6.

e. 10.

35. Given $0^\circ \le x \le 360^\circ$ and $4\sin x - 1 = -5$, then $x =$

a. 0°.

b. 90°.

c. 180°.

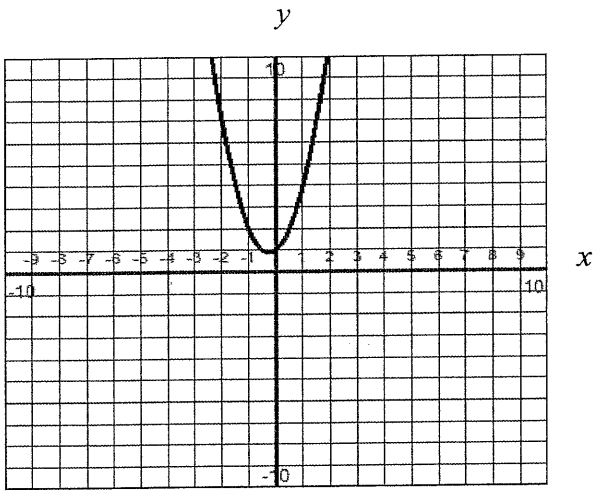
d. 270°.

e. 360°.

36. $2\sin x\cos x =$

a. $\sin 2x$.
b. $\cos 2x$.
c. $\sin\left(\frac{x}{2}+1\right)$.
d. $\sqrt{4\sin x\cos x}$.
e. $-2\cos^2 x$.

37. What is **not** true of the graph of $y = f(x)$ below?



a. This is not a one-to-one function.
b. This function has no real roots.
c. The domain of the function is $(-\infty,\infty)$.
d. This is not an odd function.
e. $f(2)$ is negative.

38. Write the equation of an ellipse with foci at $(-6,-3),(0,-3)$ and a major axis of length 10.

a. $\frac{(x-2)^2}{25}+\frac{(y-3)^2}{16}=1$

b. $\frac{(y-4)^2}{25}+\frac{(x+3)^2}{16}=1$

c. $\frac{(x+3)^2}{25}+\frac{(y+3)^2}{16}=1$

d. $\frac{(x+4)^2}{25}+\frac{(y-3)^2}{16}=1$

e. $\frac{(x-3)^2}{25}+\frac{(y-4)^2}{16}=1$

39. $\sin\theta(\csc\theta-\sin\theta)=$

a. $\cos^2\theta$.

b. $\tan\theta-\sin^2\theta$.

c. $\sec\theta-\sin^2\theta$.

d. $\cot\theta-\sin^2\theta$.

e. $\sin^2\theta$.

40. Which expresses y as a function of x?

a. $x^2+y^2=4$

b. $x=y^2-4$

c. $x=4$

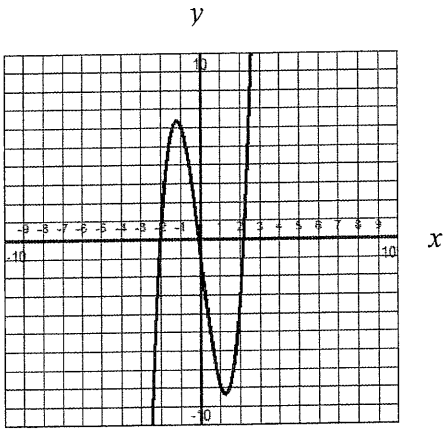
d. $x^2+4y=4$

e. $\sin\left(x^2\right)=\sin\left(y^2\right)$

41. Let $f(x)=x^2-\frac{3}{x}, g(x)=\sqrt{x+7}$. Find $f(g(2))$.

a. 6 b. 12 c. 8 d. -12 e. 0

42. Which of the following could represent the graph below?



a. $y=-x^3+3x^2-4$
b. $y=-2x-4$
c. $y=x^3$
d. $y=x^2-4$
e. $y=2x^3-9x-1$

43. Solve $\tan^2 x=1$, where $0\le x\le \pi$.

a. $\frac{\pi}{2}$
b. $\frac{\pi}{4},\frac{3\pi}{4}$
c. $1,-1$
d. 0
e. $\frac{\pi}{4}$

44. If $f(x)=\frac{1}{x-1}$ and $g(x)=\frac{1}{x}$, what is the domain of $f(g(x))$?

a. $(-\infty,1)$
b. $(-\infty,1)\cup(1,\infty)$
c. $(-\infty,0)\cup(0,1)\cup(1,\infty)$
d. $(1,\infty)$
e. $(-\infty,\infty)$

45. Evaluate: $\csc(\cos^{-1} x)$.

a. $\dfrac{\sqrt{1-x^2}}{x}$

b. $\sqrt{1-x^2}$

c. $\dfrac{x}{\sqrt{1-x^2}}$

d. $\dfrac{1}{\sqrt{1-x^2}}$

e. $\sqrt{x^2-1}$

46. Solve: $49x^4 - 25x^2 = 0$.

a. $x = \pm\dfrac{25}{49}$

b. $x = 0, \pm\dfrac{5}{7}$

c. $x = \pm\dfrac{49}{25}$

d. $x = 0, \pm\dfrac{7}{5}$

e. $x = \pm\dfrac{5}{7}$

47. What is the remainder when $x^3 + 19x^2 + 114x + 218$ is divided by $(x+4)$?

a. 4 b. 9 c. 6 d. 2 e. 0

48. The sum of a number and 6 is 8 more than twice the number. Find the equation that could be used to find this number x.

a. $x+6 = 2x+8$

b. $x+6 = x^2+8$

c. $x+6 = 2(x+8)$

d. $6x = 2x+8$

e. $x+14 = 2x$

49. Given that $f(x)$ is one-to-one, find the inverse of the function $f(x)=(x-6)^3+6$.

a. $f^{-1}(x)=\sqrt[3]{x-6}+6$

b. $f^{-1}(x)=\sqrt[3]{x}+6$

c. $f^{-1}(x)=\sqrt[3]{x+6}-6$

d. $f^{-1}(x)=\sqrt[3]{x-6}-6$

e. None of these.

50. Simplify: $\dfrac{e^{3-4x}}{e^{4-2x}}$.

a. $\dfrac{4x-3}{2x-4}$

b. $\dfrac{3-4x}{4-2x}$

c. e^{1+2x}

d. $e^{8x^2-22x+12}$

e. e^{-1-2x}

51. Write an equation of the line passing through the point $(6,-10)$ with an undefined slope.

a. $x=-10$

b. $x=6$

c. $y=6$

d. $y=-10$

e. It cannot be determined from the given information.

52. Perform the indicated operation and write the result in standard form: $(-3+2i)(-3-7i)$.

a. $-5+27i$

b. $23+15i$

c. $-5+15i$

d. $23-15i$

e. $-5-27i$