How Much Do You Know: Advanced Math

Directions

Try the questions that follow, using the Method for SAT Math Questions. When you're done, check your answers and read through the explanations in the "Check Your Work" section.

There will be an opportunity for timed practice at the end of the Advanced Math unit.

1

If $|3x - 14| = x + 4$, which of the following gives all possible values of x?

Ⓐ $-5, 9$

Ⓑ 9

Ⓒ $-2.5, 18$

Ⓓ $2.5, 9$

2

If the quadratic equation $y = 3(x + 5)^2 + 12$ is rewritten in standard form, $y = ax^2 + bx + c$, what is the value of c?

3

Which of the following is equivalent to the expression $4\sqrt[3]{ab^9}$?

Ⓐ $4a^{\frac{1}{3}}b^3$

Ⓑ $4a^3b^{\frac{1}{3}}$

Ⓒ $4a^3b^{27}$

Ⓓ $\dfrac{4}{a^{\frac{1}{3}}b^3}$

4

$$\sqrt{0.75} \times \sqrt{0.8}$$

Which of the following has the same value as the expression above?

Ⓐ $\frac{3}{5}$

Ⓑ $\frac{\sqrt{15}}{5}$

Ⓒ $\sqrt[4]{0.6}$

Ⓓ $\sqrt{1.55}$

5

If the equation of the axis of symmetry of the parabola given by $y = 3x^2 + 12x - 8$ is $x = m$, then what is the value of m?

6

If $f(x) = \sqrt[3]{x} + 3$ and $f(x) \leq 0$, what is the maximum value of x?

7

Which of the following best describes the solutions to the rational equation $\frac{3}{x-2} - \frac{12}{x^2-4} = 1$?

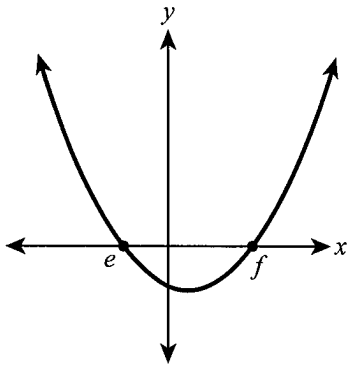
Ⓐ No solution

Ⓑ Two valid solutions

Ⓒ Two extraneous solutions

Ⓓ One valid solution and one extraneous solution

8



If e is half as far from the origin as f in the figure shown, which of the following could be the factored form of the graph's equation?

Ⓐ $y = \left(x - \frac{1}{2}\right)(x + 1)$

Ⓑ $y = (x - 1)(x + 2)$

Ⓒ $y = (x - 1)(2x + 1)$

Ⓓ $y = \left(x + \frac{1}{2}\right)(2x + 1)$

9

If $f(x) = \frac{x^2 - x - 12}{3x - 4}$ and $g(x) = x^2 - 7x + 8$, what is $f(2g(2))$?

Ⓐ -2

Ⓑ $-\frac{1}{2}$

Ⓒ 2

Ⓓ $\frac{7}{2}$

10

If $j(x) = 3x^2 + 6x - 24$, $k(x) = x + 4$, and $x = z - 5$, what is the value of $\frac{j(x)}{k(x)}$ when $z = 8$?

Ⓐ -3

Ⓑ 1

Ⓒ 3

Ⓓ 7

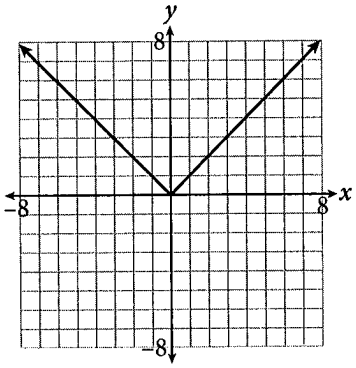
Try on Your Own

Directions

Take as much time as you need on these questions. Work carefully and methodically. There will be an opportunity for timed practice later in the book.

1

HINT: For Q1, $p(x)$ means the y-value of the function at x.



The figure shows the absolute value function $p(x) = |x|$. Which statement about the function is true?

Ⓐ The range of $p(x)$ is zero.

Ⓑ The domain of $p(x)$ is all positive numbers and zero.

Ⓒ The range of $p(x)$ is all real numbers.

Ⓓ The domain of $p(x)$ is all real numbers.

2

For what values of x is $|2x - 8| + 1$ equal to 3?

Ⓐ -3 and -5

Ⓑ -2 and -5

Ⓒ 2 and 5

Ⓓ 3 and 5

3

$$4x = |9 - 2x|$$

What is the solution to the equation shown?

4

HINT: For Q4, the absolute value of a number is its distance from zero on a number line.

Points c and d on a number line are both 4 units from point a. Which of the following gives the coordinates c and d?

Ⓐ $|x + a| = 4$

Ⓑ $|x - a| = 4$

Ⓒ $|x + 4| = a$

Ⓓ $|x - 4| = a$

5

Which of the following equations is true for some value of x?

Ⓐ $|-x + 3| + 3 = 0$

Ⓑ $|x - 3| + 3 = 0$

Ⓒ $|x + 3| - 3 = 0$

Ⓓ $|x + 3| + 3 = 0$

Try on Your Own

Directions

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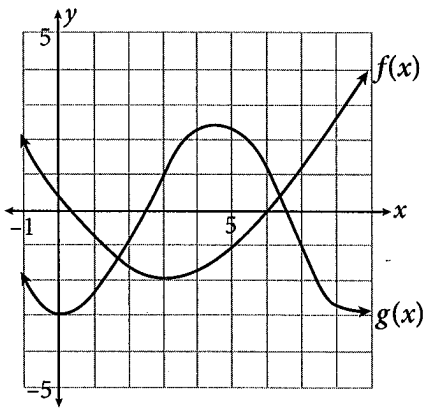
6

HINT: For Q6, remember that $f(x)$ and $g(x)$ are found on the y-axis on the graphs.



In the figure shown, what is the value of $f(3) - g(3)$?

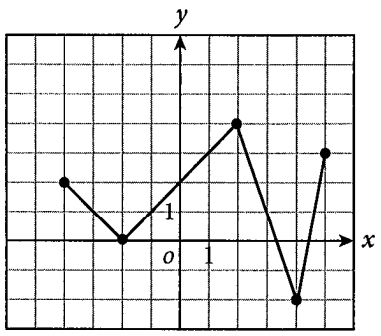
Ⓐ -3

Ⓑ 0

Ⓒ 3

Ⓓ 6

7

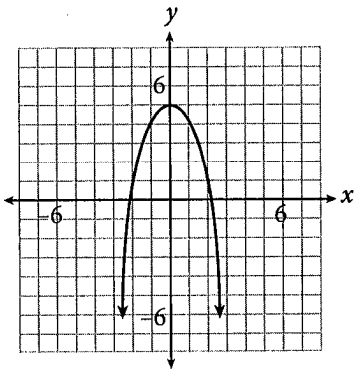


Based on the graph, if the coordinates of the maximum of $f(x)$ are (a, b) and the coordinates of the minimum of $f(x)$ are (c, d), what is the value of $a + b + c + d$?

Math

8

HINT: For Q8, the *x*-values determine the domain, while the *y*-values determine the range.



The graph of $f(x)$ is above. Which of the following represents the domain and range of the function?

Ⓐ Domain: $f(x) \geq 5$
Range: all real numbers

Ⓑ Domain: $f(x) \leq 5$
Range: all real numbers

Ⓒ Domain: all real numbers
Range: $f(x) \geq 5$

Ⓓ Domain: all real numbers
Range: $f(x) \leq 5$

9

$$f(y) = y^3 - 7y + 5$$

What is $f(5) - f(1)$?

Ⓐ -96

Ⓑ -95

Ⓒ 95

Ⓓ 96

10

x	$f(x)$
-4	4
-1	0
0	-3
3	-9
7	1

The table shows some values for a polynomial defined by the function f. Which of the following is a factor of $f(x)$?

Ⓐ $x - 1$

Ⓑ $x - 3$

Ⓒ $x + 1$

Ⓓ $x + 3$

Math

Try on Your Own

Directions

Take as much time as you need on these questions. Work carefully and methodically. There will be an opportunity for timed practice later in the book.

1

HINT: For Q1, think about the exponent rules that you will need to apply.

If $\frac{x^c(3x)^2}{9x^3} = x^6$ and $x \neq 0$, what is the value of c?

2

HINT: For Q2, look for common factors in the numerator and denominator.

$$\frac{18x^4 + 27x^3 - 36x^2}{9x^2}$$

If $x \neq 0$, which of the following is equivalent to the given expression?

Ⓐ $2x^2 + 3x - 4$

Ⓑ $2x^2 + 3x - 6$

Ⓒ $2x^4 + 3x^3 - 4x^2$

Ⓓ $2x^6 + 3x^5 - 4x^4$

3

If a and b are positive integer constants and $x^a y^b = -128$, where $x < 0$ and $y < 0$, which of the following must be true?

Ⓐ a is even

Ⓑ a is odd

Ⓒ ab is odd

Ⓓ ab is even

4

If $n^3 = -8$, what is the value of $\frac{(n^2)^3}{\frac{1}{n^2}}$

Answers to Drill questions:

a. $3^4 = 3 \times 3 \times 3 \times 3 = 81$

b. $(-5)^3 = (-5) \times (-5) \times (-5) = -125$

c. $4^2 \times 2^{-4} = \frac{16}{16} = 1$

d. $\frac{2^4}{2^3} = 2^{4-3} = 2^1 = 2$

e. $\left(\frac{1}{3}\right)^{-2} = \left(\frac{3}{1}\right)^2 = 9$

f. $(2^2)^3 = 2^{2\times3} = 2^6 = 64$

g. $(7x)^2 = 49x^2$

h. $\left(-\frac{1}{2}\right)^{-2} = (-2)^2 = 4$

i. $(a^2)^5 = a^{10}$

j. $(b^3)^{-6} = b^{-18} = \frac{1}{b^{18}}$

5

HINT: For Q5, how can you get rid of the fraction on the left side?

$$\frac{x^{5r}}{x^{3r-2s}} = x^t$$

If $r + s = 6$ and $x \neq 0$, what is the value of t in the equation shown?

Ⓐ 6

Ⓑ 12

Ⓒ 18

Ⓓ 30

Math

Try on Your Own

Directions

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6

HINT: For Q6, what do you need to do before squaring both sides?

$$8 + \frac{\sqrt{2x + 29}}{3} = 9$$

For what value of x is this equation true?

Ⓐ -10

Ⓑ -2

Ⓒ 19

Ⓓ No solution

7

$$3x = x + 14$$
$$\sqrt{3z^2 - 11} + 2x = 22$$

If $z > 0$, what is the value of z?

Ⓐ 1

Ⓑ 3

Ⓒ 5

Ⓓ 8

8

Which of the following expressions is equivalent to $-x^{\frac{1}{4}}$?

Ⓐ $-\frac{1}{4x}$

Ⓑ $-\frac{1}{x^4}$

Ⓒ $-\sqrt[4]{x}$

Ⓓ $\frac{1}{\sqrt[4]{-x}}$

9

HINT: For Q9, remember that the denominator of the exponent becomes the root, and the numerator remains the exponent.

When simplified, $8^{\frac{4}{3}}$ is what number?

_____

Answers to Drill questions:

a. $\frac{\sqrt{121}}{\sqrt{9}} = \frac{11}{3}$

b. $\sqrt{25} \times \sqrt{9} = 5 \times 3 = 15$

c. $\frac{4 \times 5\sqrt{5}}{\sqrt{5}} = 20$

d. $\frac{5\sqrt{2}}{12\sqrt{2}} = \frac{5}{12}$

e. -4

f. $\frac{\sqrt{5} \times 2\sqrt{3}\sqrt{5}}{\sqrt{3}} = 2 \times 5 = 10$

g. $\frac{4\sqrt{3}\sqrt{7} \times 5\sqrt{2}}{10\sqrt{7}} = \frac{20\sqrt{6}}{10} = 2\sqrt{6}$

h. $3 \times 2 \times 3 = 18$

i. $\frac{9|x|}{8y^2}$

j. $\frac{x^4}{y^6}$

10

HINT: For Q10, which approach is faster for you: Algebra or Backsolving?

$$\sqrt{3a + 16} - 3 = a - 1$$

In the equation above, if $a \geq 0$, which of the following is a possible value of a?

(A) 3

(B) 2

(C) 1

(D) 0

Try on Your Own

Directions

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11

What is the sum of the polynomials $6a^2 - 17a - 9$ and $-5a^2 + 8a - 2$?

Ⓐ $a^2 - 9a - 11$

Ⓑ $a^2 - 25a - 7$

Ⓒ $11a^2 - 9a - 11$

Ⓓ $11a^2 - 25a - 7$

12

What is the difference when $3x^3 + 7x - 5$ is subtracted from $8x^2 + 4x + 10$?

Ⓐ $5x^2 - 3x + 15$

Ⓑ $-3x^3 - 3x + 5$

Ⓒ $3x^3 - 8x^2 + 3x - 15$

Ⓓ $-3x^3 + 8x^2 - 3x + 15$

13

HINT: For Q13, as you calculate each term, eliminate choices. Stop when there's only one choice left.

If $A = 4x^2 + 7x - 1$ and $B = -x^2 - 5x + 3$, then what is $\frac{3}{2}A - 2B$?

Ⓐ $4x^2 + \frac{31}{2}x - \frac{9}{2}$

Ⓑ $4x^2 + \frac{41}{2}x - \frac{15}{2}$

Ⓒ $8x^2 + \frac{31}{2}x - \frac{9}{2}$

Ⓓ $8x^2 + \frac{41}{2}x - \frac{15}{2}$

14

HINT: For Q14, which is more efficient for you: Math or backsolving the choices?

If $x^3 - 9x = 9 - x^2$, which of the following CANNOT be the value of x?

Ⓐ -3

Ⓑ -1

Ⓒ 1

Ⓓ 3

15

$(2x^2 + 3x - 4)(3x + 2) = 6x^3 + ax^2 - 6x - 8$

In the given equation, a is a constant. If the equation is true for all values of x, what is the value of a?

Ⓐ 4

Ⓑ 9

Ⓒ 13

Ⓓ 16

Try on Your Own

Directions

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16

HINT: For Q16, because $a - 3$ is not a factor of the numerator, you'll have to use polynomial long division.

Which of the following is equivalent to $\frac{2a^2 - 5a - 1}{a - 3}$?

Ⓐ $2a - 2$

Ⓑ $2a + 1 - \frac{2}{a - 3}$

Ⓒ $2a + \frac{2}{a - 3}$

Ⓓ $2a + 1 + \frac{2}{a - 3}$

17

HINT: For Q17, if the fraction simplifies to $ax + b$, the denominator divides evenly into the numerator. Does that suggest another approach?

$$\frac{6x^2 + 19x + 10}{2x + 5}$$

If $ax + b$ represents the simplified form of the expression shown, then what is the value of $a + b$?

Ⓐ 2

Ⓑ 3

Ⓒ 5

Ⓓ 6

18

Which of the following is equivalent to $\frac{4x^2 - 6x}{2x + 2}$?

Ⓐ $2x - \frac{10}{2x + 2}$

Ⓑ $2x - 5 + \frac{10}{2x + 2}$

Ⓒ $2x - 3$

Ⓓ $2x + 5 - \frac{10}{2x + 2}$

19

HINT: For Q19, the quotient (result of division) times the divisor (the denominator) equals the dividend (the numerator). For Q19, stop as soon as you have the value of t.

The equation $\frac{36x^2 + 16x - 21}{tx - 4} = -9x + 5 - \frac{1}{tx - 4}$ is true for all values of x for which $x \neq \frac{4}{t}$, where t is a constant. What is the value of t?

Ⓐ -20

Ⓑ -4

Ⓒ 4

Ⓓ 12

20

If the polynomial $f(x)$ is evenly divisible by $x - 5$ and the polynomial $g(x) = f(x) + 4$, what is the value of $g(5)$?

Ⓐ -4

Ⓑ 0

Ⓒ 4

Ⓓ 9

Try on Your Own

Directions

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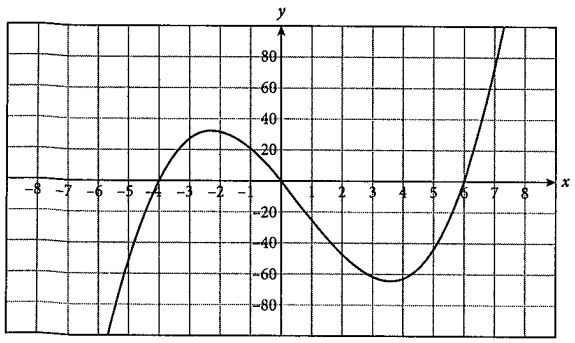
21

HINT: For Q21, set each factor equal to 0 and solve for x to find the x-intercepts.



Which of the following could be the equation of the function in the graph?

Ⓐ $f(x) = x^2(x + 4)(x - 6)$

Ⓑ $f(x) = x(x + 4)(x - 6)$

Ⓒ $f(x) = x^2(x - 4)(x + 6)$

Ⓓ $f(x) = x(x - 4)(x + 6)$

22

x	$h(x)$
-3	6
-1	0
0	-5
2	-8

The function h is defined by a polynomial. The table shown gives some of the values of x and $h(x)$. Which of the following must be a factor of $h(x)$?

Ⓐ $x - 8$

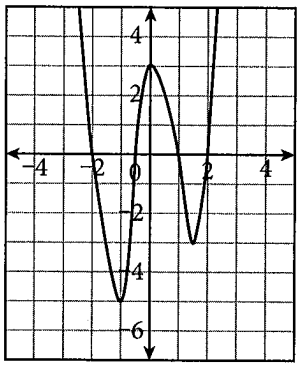
Ⓑ $x - 1$

Ⓒ $x + 1$

Ⓓ $x + 5$

23

HINT: In Q23, the definition of the b function has a variable in the denominator. What does this tell you about the value of x?



The graph of the function $a(x)$ is shown. If $b(x) = \frac{1}{x}$, which of the following is a true statement about $b(a(x))$?

Ⓐ $b(a(x))$ is defined for all real numbers.

Ⓑ $b(a(x))$ is undefined for exactly one real value of x.

Ⓒ $b(a(x))$ is undefined for at least four real values of x.

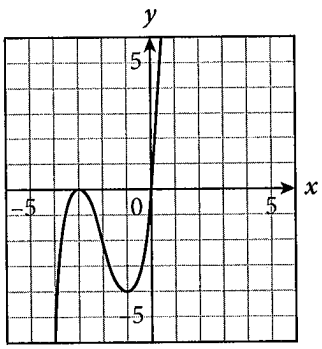
Ⓓ $b(a(x))$ is undefined for all real numbers.

Math

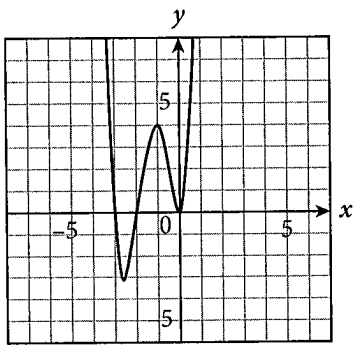
24

If function f has exactly two distinct real zeros, which of the following graphs could be the complete graph of $f(x)$?

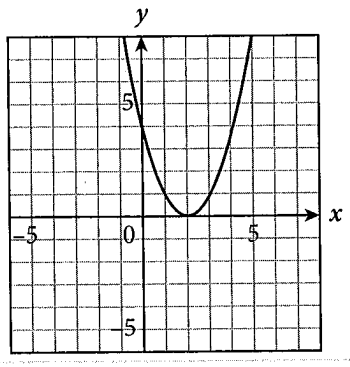
Ⓐ



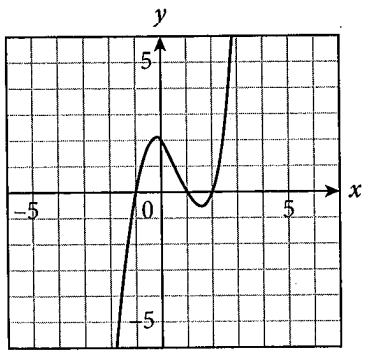
Ⓑ



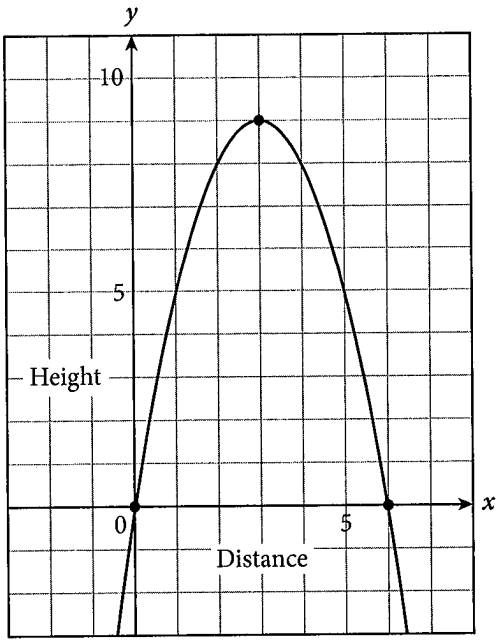
Ⓒ



Ⓓ



25



The graph of $f(x) = -(x - 3)^2 + 9$ approximates the trajectory of a water balloon shot from a cannon at ground level. In terms of the trajectory, what information is represented by a root of this function?

Ⓐ The maximum height achieved by the balloon

Ⓑ The total horizontal distance traveled by the balloon

Ⓒ The maximum speed of the balloon

Ⓓ The initial acceleration of the balloon

Try on Your Own

Directions

Take as much time as you need on these questions. Work carefully and methodically. There will be an opportunity for timed practice later in the book.

26

HINT: For Q26, keep track of your calculations by making a chart with the number of applicants at the start of the day and the number of applicants eliminated.

In determining the winner of a speech-writing competition, a panel of judges eliminates one-quarter of the remaining applicants per day of deliberations. If 128 students entered the competition, how many applicants have been eliminated by the end of the third day of deliberations?

_____

27

A health club's membership has increased at a rate of 16 percent per year for the past four years. The club currently has 42 members. If this trend continues, how many years will it take for the club's membership to exceed 100 members?

Ⓐ 4 years

Ⓑ 5 years

Ⓒ 6 years

Ⓓ 7 years

28

HINT: For Q28, no original amount is given. What would be a good number to pick for that amount?

^{14}C (an isotope of carbon) has a half-life of 5,600 years, which means half of the ^{14}C in the remains of an organism will decay in that time period. If a sample of a petrified tree contains 6.25 percent of its original ^{14}C, how long ago did the tree die?

Ⓐ 22,400 years

Ⓑ 28,000 years

Ⓒ 35,000 years

Ⓓ 89,600 years

29

HINT: For Q29, is she saving more, the same, or less each month? What does that tell you about the function?

Penelope receives the same amount of money each month for her allowance. Each month she spends half of her allowance and puts the rest in a piggy bank. On her 8th birthday, the piggy bank contains $40. If the piggy bank contains $244 after 2 years, what is her monthly allowance in dollars?

_____

30

Account X earns a monthly interest equal to 2 percent of the original investment, while account Y earns a monthly interest equal to 2 percent of the current value of the account. If $500 is invested into each account, what is the positive difference between the value of account X and account Y after three years? (Round your answer to the nearest dollar.)

_____

Math

Try on Your Own

Directions

Take as much time as you need on these questions. Work carefully and methodically. There will be an opportunity for timed practice later in the book.

31

HINT: For Q31, multiply both sides by a common denominator or cross-multiply. (They are the same thing.)

Given the equation $\frac{6}{x} = \frac{3}{k+2}$ and the constraints $x \neq 0$ and $k \neq -2$, what is x in terms of k?

Ⓐ $x = 2k + 4$

Ⓑ $x = 2k + 12$

Ⓒ $x = 2k - \frac{1}{4}$

Ⓓ $x = \frac{1}{4}k + 12$

32

HINT: For Q32, how do you add fractions with different denominators?

$$\frac{3a+9}{(a-3)^2} + \frac{-9}{3a-9}$$

In the given expression, $(a-3)^2 = 6$. What is the value of the expression?

_____

33

If $a > 6$, which of the following is equivalent to $\frac{\frac{2}{a}}{\frac{1}{a-2} + \frac{1}{a-6}}$?

Ⓐ $2a^2 - 16a + 24$

Ⓑ $a(2a - 8)$

Ⓒ $\frac{a^2 - 8a + 12}{a^2 - 4a}$

Ⓓ $\frac{2a - 8}{a^2 - 8a + 12}$

34

If $\frac{x^3 - 3x^2}{x - 3} = 9$, what is the value of x?

Ⓐ -3

Ⓑ 0

Ⓒ 3

Ⓓ 9

35

If $\frac{16}{7x+4} + A$ is equivalent to $\frac{49x^2}{7x+4}$, what is A in terms of x?

Ⓐ $7x + 4$

Ⓑ $7x - 4$

Ⓒ $49x^2$

Ⓓ $49x^2 + 4$

36

HINT: For Q36, make sure you pay attention to all of the information given to you.

If $\frac{1-2c}{3c} - \frac{c-8}{12} = 0$ and $c < 0$, what is the value of c?

Ⓐ -4

Ⓑ -2

Ⓒ 1

Ⓓ 2

Math

Try on Your Own

Directions

Take as much time as you need on these questions. Work carefully and methodically. There will be an opportunity for timed practice later in the book.

1

Which of the following is an equivalent form of the expression $(6 - 5x)(15x - 11)$?

Ⓐ $-75x^2 + 35x - 66$

Ⓑ $-75x^2 + 145x - 66$

Ⓒ $90x^2 - 141x + 55$

Ⓓ $90x^2 + 9x + 55$

2

HINT: For Q2, what is the easiest way to factor the denominator?

Which of the following is equivalent to $\frac{x^2 - 10x + 25}{3x^2 - 9x - 30}$?

Ⓐ $\frac{3(x - 2)}{(x + 5)}$

Ⓑ $\frac{3(x + 2)}{(x - 5)}$

Ⓒ $\frac{(x - 5)}{3(x + 2)}$

Ⓓ $\frac{(x + 5)}{3(x - 2)}$

3

HINT: For Q3, what value in the denominator would make the fraction undefined?

For what positive value of x is the equation $\frac{3}{2x^2 + 4x - 6} = 0$ undefined?

4

What is the sum of the roots of $3x^2 + 9x = 54$?

Ⓐ -6

Ⓑ -3

Ⓒ 3

Ⓓ 6

5

$f(x) = (1.3x - 3.9)^2 - (0.69x^2 - 0.14x - 9.79)$

Which of the following functions is equivalent to the function given?

Ⓐ $f(x) = (x - 5)^2$

Ⓑ $f(x) = x^2 + 10.28x + 5.42$

Ⓒ $f(x) = 0.61x^2 + 0.14x + 25$

Ⓓ $f(x) = 1.3(x - 3)^2 - 0.69x^2 + 0.14x + 9.79$

Answers to Drill questions:

a. $a^2 + 8a + 15 = (a + 3)(a + 5)$

b. $x^2 + 4x - 21 = (x - 3)(x + 7)$

c. $b^2 - 7b - 18 = (b + 2)(b - 9)$

d. $y^2 - 10y + 24 = (y - 4)(y - 6)$

e. $x^2 + \frac{1}{2}x - \frac{1}{2} = (x + 1)\left(x - \frac{1}{2}\right)$

f. $5x^2 + 10x + 5 = 5(x + 1)(x + 1)$

g. $2x^2 + 12x - 54 = 2(x - 3)(x + 9)$

h. $3x^2 - 6x + 3 = 3(x - 1)(x - 1)$

i. $x^2 + 3xy + 2y^2 = (x + y)(x + 2y)$

j. $4a^2 + 4ab - 8b^2 = 4(a - b)(a + 2b)$

Math

Try on Your Own

Directions

Take as much time as you need on these questions. Work carefully and methodically. There will be an opportunity for timed practice later in the book.

6

For all a and b, what is the sum of $(a - b)^2$ and $(a + b)^2$?

Ⓐ $2a^2$

Ⓑ $2a^2 - 2b^2$

Ⓒ $2a^2 + 2b^2$

Ⓓ $2a^2 + 4ab + 2b^2$

7

HINT: For Q7, how can you remove the fraction to make factoring easier?

What is the positive difference between the roots of the equation $y = \frac{1}{3}x^2 - 2x + 3$?

8

HINT: For Q8, look for a classic quadratic in the denominator.

$$f(x) = \frac{3}{(x - 7)^2 + 6(x - 7) + 9}$$

For which value of x is the function $f(x)$ undefined?

9

HINT: One of the given equations in Q9 is a classic quadratic.

A rectangle has an area of $x^4 - 196$. If the width of the rectangle is $x^2 - 14$, what is the length? (The area of a rectangle is its length times its width.)

Ⓐ $x + 14$

Ⓑ $x^2 + 14$

Ⓒ $x^2 - 14$

Ⓓ $x - 14$

10

In the expression $2x^2 - 28x + 98 = a(x - b)^2$, $a > 1$ and both a and b are constants. Which of the following could be the value of b?

Ⓐ -7

Ⓑ 7

Ⓒ 14

Ⓓ 49

Try on Your Own

Directions

Take as much time as you need on these questions. Work carefully and methodically. There will be an opportunity for timed practice later in the book.

11

Which of the following is a value of x that satisfies the equation $x^2 + 2x - 5 = 0$?

Ⓐ -1

Ⓑ $1 - \sqrt{6}$

Ⓒ $1 + \sqrt{6}$

Ⓓ $-1 - \sqrt{6}$

12

$$a^2 - 12a - 72 = 0$$

Which of the following is the greatest possible value of a?

Ⓐ $12\sqrt{3}$

Ⓑ $36\sqrt{3}$

Ⓒ $6 + \sqrt{3}$

Ⓓ $6(1 + \sqrt{3})$

Answers to Drill questions:

a. $x = 5 \pm 3\sqrt{3}$

b. $x = -4 \pm \sqrt{10}$

c. $x = \frac{1 \pm 3\sqrt{5}}{2}$

d. $x = \frac{-1 \pm \sqrt{65}}{4}$

e. $x = 3a \pm a\sqrt{7}$

13

HINT: For Q13, treat the square root in the b term just like any other: divide it by 2, then square it.

$$x^2 - (6\sqrt{5})x = -40$$

What is the sum of the possible values of x in the given equation?

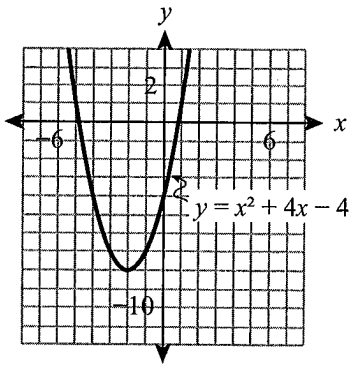
Ⓐ 15

Ⓑ $4\sqrt{5}$

Ⓒ $6\sqrt{5}$

Ⓓ 60

14



Which of the following is equivalent to the equation of the graph shown?

Ⓐ $(x - 2)^2 - 8$

Ⓑ $(x + 2)^2 - 8$

Ⓒ $(x - 2)^2 + 8$

Ⓓ $(x + 2)^2 + 8$

Math

Try on Your Own

Directions

Take as much time as you need on these questions. Work carefully and methodically. There will be an opportunity for timed practice later in the book.

15

HINT: For Q15, use the discriminant.

Given the equation $2x^2 + 8x + 4 + 2z = 0$, for what value of z is there exactly one solution for x?

16

The product of all the solutions to the equation $3v^2 + 4v - 2 = 0$ is M. What is the value of M?

Ⓐ -3

Ⓑ $-\frac{2}{3}$

Ⓒ $-\frac{1}{3}$

Ⓓ $\frac{4}{3}$

17

What are the solutions to the equation $4x^2 - 24x + 16 = 0$?

Ⓐ $x = 3 \pm \sqrt{5}$

Ⓑ $x = 4 \pm \sqrt{6}$

Ⓒ $x = 5 \pm \sqrt{3}$

Ⓓ $x = 5 \pm 2\sqrt{2}$

18

$$3x^2 = m(5x + v)$$

What are the values of x that satisfy the equation above, where m and v are constants?

Ⓐ $x = -\frac{5m}{6} \pm \frac{\sqrt{25m^2 + 12mv}}{6}$

Ⓑ $x = \frac{5m}{6} \pm \frac{\sqrt{25m^2 + 12mv}}{6}$

Ⓒ $x = -\frac{5m}{3} \pm \frac{\sqrt{12m^2 + 25mv}}{3}$

Ⓓ $x = \frac{5m}{3} \pm \frac{\sqrt{25m^2 + 12mv}}{3}$

19

HINT: For Q19, start with the standard form of a quadratic equation.

$$x(dx + 10) = -3$$

The equation shown, where d is a constant, has no real solutions. The value of d could be which of the following?

Ⓐ -12

Ⓑ 4

Ⓒ 8

Ⓓ 10

20

Which equation has no real solutions?

Ⓐ $x^2 + 8x - 12 = 0$

Ⓑ $x^2 - 8x + 12 = 0$

Ⓒ $x^2 - 9x + 21 = 0$

Ⓓ $x^2 + 100x - 1 = 0$

Math

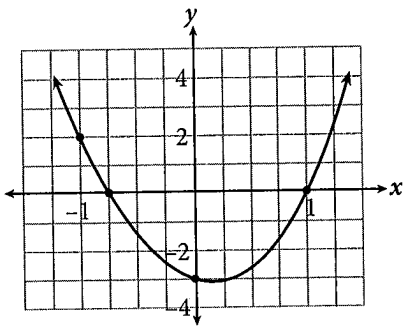
Try on Your Own

Directions

Take as much time as you need on these questions. Work carefully and methodically. There will be an opportunity for timed practice later in the book.

21

HINT: For Q21, which form of a quadratic equation tells you the *x*-intercepts?



The following quadratic equations are all representations of the graph shown. Which equation represents the exact values of the x-intercepts of the graph?

Ⓐ $y = (4x - 3)(x + 1)$

Ⓑ $y = (4x + 3)(x - 1)$

Ⓒ $y = (3x - 4)(x + 1)$

Ⓓ $y = (3x + 4)(x - 1)$

22

HINT: For Q22, through which point on a parabola does the axis of symmetry pass?

Which equation represents the axis of symmetry for the graph of the quadratic function $f(x) = -\frac{11}{3}x^2 + 17x - \frac{43}{13}$?

Ⓐ $x = -\frac{102}{11}$

Ⓑ $x = -\frac{51}{22}$

Ⓒ $x = \frac{51}{22}$

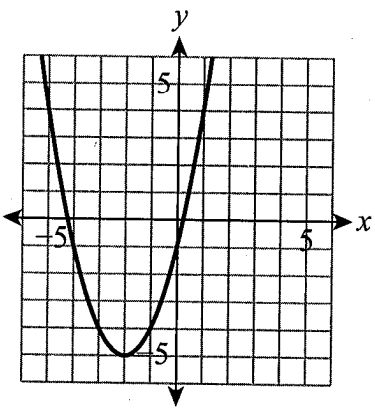
Ⓓ $x = \frac{102}{11}$

23

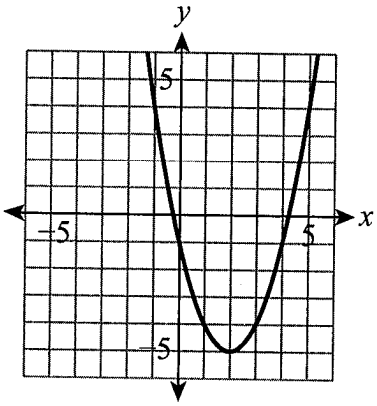
$$fx = -(x - p)^2 + q$$

Which of the following represents the graph of $y = f(x)$ if $p < 0$ and $q > 0$?

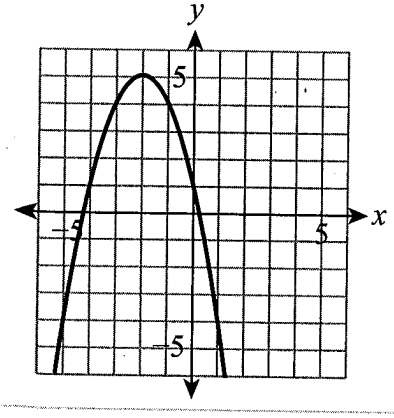
Ⓐ



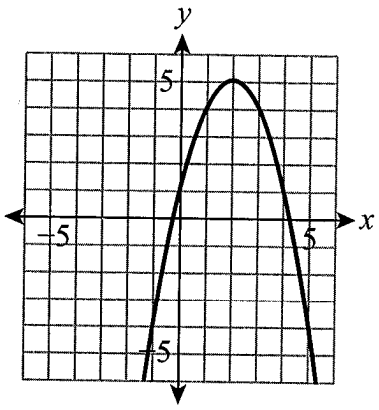
Ⓑ



Ⓒ



Ⓓ



24

The graph of $y = a(x + 1)(x - 6)$ has a vertex at (h, k). What is the value of h?

25

HINT: For Q25, what does "maximum height" correspond to on the graph of a quadratic equation?

A toy rocket is fired from ground level. The height of the rocket with respect to time can be represented by a quadratic function. If the toy rocket reaches a maximum height of 34 feet 3 seconds after it was fired, which of the following functions could represent the height, h, of the rocket t seconds after it was fired?

Ⓐ $h(t) = -16(t - 3)^2 + 34$

Ⓑ $h(t) = -16(t + 3)^2 + 34$

Ⓒ $h(t) = 16(t - 3)^2 + 34$

Ⓓ $h(t) = 16(t + 3)^2 + 34$

Math

Try on Your Own

Directions

Take as much time as you need on these questions. Work carefully and methodically. There will be an opportunity for timed practice later in the book.

26

HINT: For Q26, note that both equations are equal to *a*.

$$\begin{cases} a = b^2 + 4b - 12 \\ a = -12 + b \end{cases}$$

The ordered pair (a, b) satisfies the system of equations shown. What is one possible value of b?

Ⓐ -6

Ⓑ -3

Ⓒ 2

Ⓓ 3

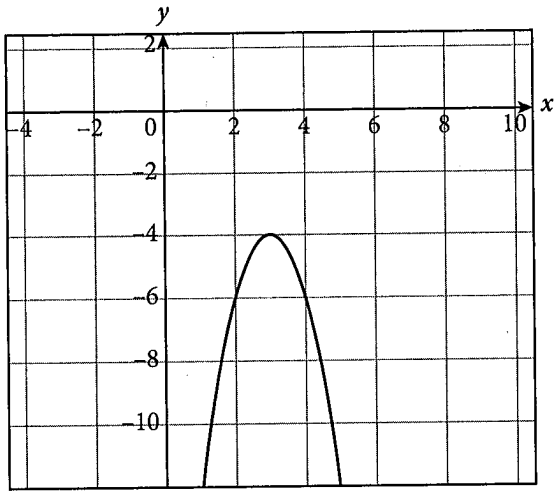
27

In the xy-coordinate plane, the graph of $y = 5x^2 - 12x$ intersects the graph of $y = -2x$ at points $(0, 0)$ and (a, b). What is the value of a?

28

The graph of $f(x) = x^2 + x$ intersects the graph of $g(x) = d$, where d is a constant, at exactly one point. What is the value of d?

29



The graph of the function f, defined by $f(x) = -2(x - 3)^2 - 4$, is shown in the xy-plane. The function g (not shown) is defined by $g(x) = 2x - 10$. If $f(c) = g(c)$, what is one possible value of c?

Ⓐ -6

Ⓑ -4

Ⓒ 2

Ⓓ 4

30

HINT: For Q30, solve for the points of intersection, then use the formula for distance in the coordinate plane.

On the xy-plane, points P and Q are the two points where the parabola with the equation $y = 3x^2 + \frac{14}{3}x - \frac{73}{3}$ and the line with the equation $y = -\frac{4}{3}x - \frac{1}{3}$ meet. What is the distance between point P and point Q?

Ⓐ 5

Ⓑ 8

Ⓒ 10

Ⓓ 12

Math

How Much Have You Learned: Advanced Math

Directions

This "How Much Have You Learned?" section will allow you to measure your growth and confidence in Advanced Math skills.

For test-like practice, give yourself 15 minutes for this question set. Be sure to use the Method for SAT Math Questions. When you're done, check your answers and read through the explanations, even for the questions you answered correctly. Don't forget to celebrate your progress!

1

If $|5a| = 2a - 15$, which of the following gives all possible values of a?

Ⓐ -5

Ⓑ $\frac{15}{7}$

Ⓒ $-5, \frac{15}{7}$

Ⓓ No solution

2

If the quadratic equation $y = 4(x + 3)^2 + 7$ is rewritten in standard form, $y = ax^2 + bx + c$, what is the value of $b + c$?

_____

3

Which of the following is equivalent to $\sqrt{0.5} \times \sqrt{0.4}$?

Ⓐ $\frac{1}{5}$

Ⓑ $\frac{\sqrt{5}}{5}$

Ⓒ $\sqrt[4]{0.2}$

Ⓓ $\sqrt{0.9}$

4

Which of the following is equivalent to the expression $\frac{\sqrt[3]{8a^9b^6}}{ab^2}$?

Ⓐ $2a^2$

Ⓑ $\frac{2a^2}{b}$

Ⓒ $8a^2b$

Ⓓ $\frac{8a^2}{b^3}$

5

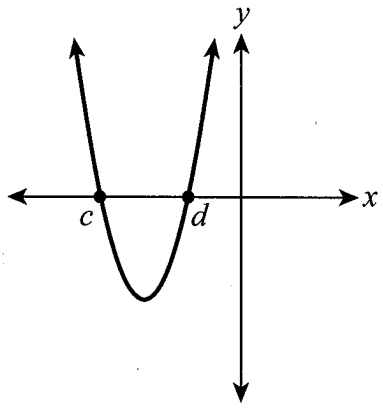
If $h(x) = x^2 + 14$, what is the minimum value of $h(x)$?

_____

6

The vertex of the parabola given by $y = 2x^2 - 8x - 3$ is at point (h, k). What is the value of k?

7



If c is three times farther from the origin than d in the figure shown, which of the following could be the factored form of the graph's equation?

Ⓐ $y = (x + 2)(2x + 12)$

Ⓑ $y = (x - 2)(2x - 12)$

Ⓒ $y = (3x + 3)(x + 4)$

Ⓓ $y = (x + 2)(3x + 12)$

8

If $f(x) = \frac{x^2 + 5x + 10}{3x}$ and $g(x) = x + 4$, what is $f(g(1))$?

Ⓐ 1

Ⓑ 4

Ⓒ 15

Ⓓ 60

9

Which of the following best describes the solutions to the rational equation $\frac{2}{x+3} - \frac{-12}{x^2 - 9} = 1$?

Ⓐ No solution

Ⓑ Two extraneous solutions

Ⓒ Two valid solutions

Ⓓ One valid solution and one extraneous solution

10

If $f(x) = 2x^2 - 14x + 20$, $g(x) = x - 5$, and $x = 10$, what is the value of $\frac{f(x)}{g(x)}$?

Ⓐ 5

Ⓑ 16

Ⓒ 80

Ⓓ 160