

8

$$\sqrt{x^2 + p^2} = q$$

In the given equation, p and q are positive constants. Which of the following is one of the solutions to the given equation?

- A) $-\sqrt{q^2 - p^2}$
 B) $\sqrt{p^2 + q^2}$
 C) $\sqrt{q - p^2}$
 D) $-p^2 - q^2$

9

$$\sqrt{(x+6)(x-6)} = 8$$

What is the positive solution to the given equation?

10

10

$$2u = \frac{18}{v} - 6$$

The given equation relates the numbers u and v , where $u > 0$ and $v > 0$. Which equation correctly expresses v in terms of u ?

- A) $v = \frac{9}{u+3}$
 B) $v = \frac{u}{9} - 3$
 C) $v = \frac{u}{9} + 3$
 D) $v = \frac{u+3}{9}$

11

$$\frac{k}{3x+3y} = k+1$$

The given equation relates the distinct positive numbers x , y , and k . Which equation correctly expresses $x+y$ in terms of k ?

- A) $x+y = \frac{k}{3k+1}$
 B) $x+y = \frac{k}{3k+3}$
 C) $x+y = \frac{3k}{k+1}$
 D) $x+y = \frac{3k+3}{k}$

12

$$\left(\frac{1}{8} + \frac{1}{x}\right)t = 1$$

The given equation represents the number of days t it will take Jim and Andy to paint a 300-foot fence working together given that it would take Jim x days to paint the fence working alone. If it takes 6 days for Jim and Andy to paint the fence working together, how many days would it have taken Jim to paint the fence working alone?

24

13

$$\frac{a}{b} = \frac{a+1}{2c}$$

The given equation relates the distinct positive numbers a , b , and c . Which equation correctly expresses a in terms of b and c ?

A) $a = \frac{b}{b-2c}$

B) $a = \frac{b}{2c-b}$

C) $a = \frac{b+c}{2c}$

D) $a = \frac{c-b}{2c}$

14

$$\frac{3r}{t} = 6\sqrt{2s}$$

The given equation relates the positive numbers r , s , and t . Which equation correctly expresses s in terms of r and t ?

A) $s = \frac{r^2}{2t^2}$

B) $s = \frac{r^2}{4t^2}$

C) $s = \frac{r^2}{8t^2}$

D) $s = \frac{3r^2}{4t^2}$

15

$$ax + 7a + x + 7 = b$$

In the given equation, a and b are positive constants. Which equation correctly expresses $x + 7$ in terms of a and b ?

A) $x + 7 = \frac{b}{a} - 7$

B) $x + 7 = \frac{b}{2a}$

C) $x + 7 = \frac{b}{a+1}$

D) $x + 7 = \frac{b-1}{a}$

16

If $(x+1)(x-2) = 7x-18$, what is the value of $7x-18$?

10

17

$$xy - 1 = z - xz$$

The given equation relates the positive numbers x , y , and z . Which equation correctly expresses x in terms of y and z ?

A) $\frac{z}{y} + 1$

B) $\frac{z}{y+z} + 1$

C) $\frac{z+1}{yz}$

D) $\frac{z+1}{y+z}$

18

If $\frac{2\sqrt{x+4}}{3} = 6$ and $x > 0$, what is the value of x ?

77

19

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

$$\frac{2x+y}{x-2y} = 3$$

$$17y = x$$

$$2x+y = 3x-6y$$

$$\frac{7y+y}{7y-y} = \frac{8}{6} = \frac{4}{3}$$

20

$$\frac{x-n}{3} = x(x-n)$$

Which of the following are solutions to the given equation, where n is a positive constant greater than 1?

I. $\frac{1}{3}$

II. $\frac{n}{3}$

III. n

A) I and II only

☒ B) I and III only

C) II and III only

D) I, II, and III

$$\frac{x-n}{3} - x(x-n) = 0$$

$$(x-n)\left(\frac{1}{3} - x\right) = 0$$

$$x = n \text{ or } \frac{1}{3}$$

21

8 If $x + y = \sqrt{x^2 + y^2 + 16}$, what is the value of xy ?

$$(x+y)^2 = x^2 + 2xy + y^2 \quad (1)$$

$$(\sqrt{x^2 + y^2 + 16})^2 = x^2 + y^2 + 16 \quad (2)$$

$$(1) = (2) \quad x^2 + 2xy + y^2 = x^2 + y^2 + 16$$

$$2xy = 16 \quad xy = 8$$

22

$$16 \quad \sqrt{x+9} = \frac{x}{2} - 3$$

What is the solution to the given equation?

$$2\sqrt{x+9} = x-6$$

$$4(x+9) = (x-6)^2 = x^2 - 12x + 36$$

$$4x + 36 = x^2 - 12x + 36$$

$$4x = x^2 - 12x \Rightarrow x^2 - 16x$$

$$0 = x(x-16)$$

$$x = 0, \text{ or } 16$$

$$\underline{x=0} \text{ X } \quad \frac{x}{2} - 3 = -3$$

$$x=16 \quad \frac{16}{2} - 3 = 5$$

23

$$\sqrt{2(x-k)} = x-k$$

In the given equation, k is a constant. Which of the following is the sum of the solutions to the given equation?

A) $2k$

B) $k+1$

C) $2k-2$

☒ D) $2k+2$

24

$$\frac{x}{\sqrt{x+b}} = 7 - \frac{b}{\sqrt{x+b}}$$

In the given equation, b is a positive constant. Which of the following is the solution to the given equation?

A) $7-b$

☒ B) $49-b$

C) $b-49$

D) b^2+49

25

If $\sqrt{x+2} = 2 - \sqrt{x}$, what is the value of $2 - \sqrt{x}$?

A) $\frac{1}{2}$ $\sqrt{x+2} = 2 - \sqrt{x}$

☒ B) $\frac{3}{2}$ $(\sqrt{x+2})^2 = (2 - \sqrt{x})^2$

C) $\sqrt{\frac{5}{2}}$ $x+2 = 4 - 4\sqrt{x} + x$

D) 2

$$4\sqrt{x} = 2$$

$$\sqrt{x} = \frac{1}{2}$$

$$2 - \frac{1}{2} = \frac{3}{2}$$

$$\sqrt{2(x-k)} = x-k$$

In the given equation, k is a constant. Which of the following is the sum of the solutions to the given equation?

- A) $2k$
- B) $k+1$
- C) $2k-2$
- ☒ D) $2k+2$

$$(\sqrt{2(x-k)})^2 = (x-k)^2$$

$$2(x-k) = (x-k)^2$$

$$(x-k)^2 - 2(x-k) = 0 \Rightarrow (x-k)(x-k) - 2(x-k) = 0$$

$$(x-k)(x-k-2) = 0 \quad (x-k)(x-k-2)$$

$$x-k=0 \quad \text{or} \quad x-k-2=0$$

$$\Downarrow \quad \Downarrow$$

$$x=k \quad x=k+2$$

$$k+k+2=2k+2$$

$$\frac{x}{\sqrt{x+b}} = 7 - \frac{b}{\sqrt{x+b}}$$

In the given equation, b is a positive constant. Which of the following is the solution to the given equation?

- A) $7-b$
- ☒ B) $49-b$
- C) $b-49$
- D) b^2+49

$$\frac{x}{\sqrt{x+b}} + \frac{b}{\sqrt{x+b}} = 7$$

$$\frac{x+b}{\sqrt{x+b}} = 7$$

$$\frac{\cancel{\sqrt{x+b}} \cdot \sqrt{x+b}}{\cancel{\sqrt{x+b}}} = 7$$

$$\sqrt{x+b} = 7$$

$$x+b = 49$$

$$x = 49 - b$$

EXERCISE 2: Answers for this exercise start on page 326.

1

$$ax - b = 3(2x + 1)$$

In the given equation, a and b are constants. The equation has no solution. Which of the following could be the values of a and b ?

A) $a = 2$ and $b = -3$

B) $a = 2$ and $b = 3$

C) $a = 6$ and $b = -3$

D) $a = 6$ and $b = 3$

$$ax - b = 6x + 3$$

$$ax - 6x = b + 3$$

$$(a - 6)x = 0 \quad a = 6$$

$$b + 3 \neq 0 \quad b \neq -3$$

2

$$|-8x - 12| = 34$$

Exactly how many solutions does the given equation have?

A) Zero

B) One

C) Two

D) Four

$$-8x - 12 = 34$$

$$-8x = 46 \quad x = -\frac{46}{8}$$

$$-8x - 12 = -34$$

$$-8x = -22 \quad x = \frac{22}{8}$$

3

$$9 - 6x = -\frac{1}{11}(66x - 99)$$

How many solutions does the given equation have?

A) Zero

B) Exactly one

C) Exactly two

D) More than two

$$9 - 6x = -\frac{1}{11}(66x - 99)$$

$$-\frac{1}{11} \cdot 11(6x - 9)$$

$$= -(6x - 9)$$

$$= -6x + 9 = 9 - 6x$$

$$9 - 6x = 9 - 6x$$

4

$$\frac{3}{2}(x + m) = mx$$

In the given equation, m is a constant. If the equation has exactly one solution, which of the following could NOT be the value of m ?

A) $-\frac{3}{2}$

B) 0

C) $\frac{1}{2}$

D) $\frac{3}{2}$

$$\frac{3}{2}(x + m) = mx$$

$$\frac{3}{2}x + \frac{3}{2}m = mx$$

$$m = \frac{3}{2}$$

$$\frac{3}{2}x - \frac{3}{2}x = -\frac{3}{2} \times \frac{3}{2}$$

$$0 = -\frac{9}{4}$$

5

The expression $1.56x^2 - 0.84x - 1.08$ can be rewritten as $n(26x^2 - 14x - 18)$, where n is a constant. What is the value of n ?

$$0.06$$

6

$$x - \frac{1}{2}(3x + 8) = 2\left(2 - \frac{1}{4}x\right)$$

How many solutions are there to the given equation?

A) Zero

B) Infinitely many

C) Exactly one

D) Exactly two

$$x - \frac{3}{2}x - 4 = 4 - \frac{1}{2}x$$

$$x - \frac{3}{2}x + \frac{1}{2}x = 4 + 4$$

$$\frac{3}{2}x - \frac{3}{2}x = 8$$

$$0 = 8$$

7

$$\frac{2}{3}ax + 3 = \frac{8}{3}x + 9b$$

In the given equation, a and b are constants. The equation has infinitely many solutions. What is the value of $\frac{a}{b}$?

- A) $\frac{3}{4}$
 B) $\frac{4}{3}$
 C) 6
 D) 12

8

$$3x + a(3 - 2x) = 12 - 7x$$

In the given equation, a is a constant. The equation has no solution. What is the value of a ?

- A) -2
 B) 2
 C) 4
 D) 5

9

$$11 + (-6) = 5$$

$$2|10 - 4x| + 9 = 77$$

What is the sum of the solutions to the given equation?

$$2|10 - 4x| + 9 = 77 \quad 2|10 - 4x| = 68$$

$$|10 - 4x| = 34 \quad 10 - 4x = 34 \text{ or } -34$$

$$10 - 4x = 34 \quad -4x = 24 \quad x = -6$$

$$10 - 4x = -34 \quad -4x = -44 \quad x = 11$$

10

$$\sqrt{-x} = x$$

How many distinct real solutions does the given equation have?

- A) Zero
 B) Exactly one
 C) Exactly two
 D) Infinitely many

$$-x \geq 0$$

$$\sqrt{-x} = x$$

$$x = 0$$

$$(x+1)(x-1) = x(x-1)$$

$$x+1 = x \quad \text{X}$$

11

$$|x - 13| = |x + 5|$$

What is the solution to the given equation?

- A) -8
 B) -4
 C) 4
 D) 8

12

$$-10x + 16jx = 0$$

In the given equation, j is a constant. The equation has infinitely many solutions. What is the value of j ?

$$\frac{5}{8}$$

13

$$g(x) = \left| \frac{7}{9}x - 40 \right|$$

The function g is defined by the given equation. For which of the following values of a does

$$g(a) = a?$$

- A) -180
 B) $\frac{27}{2}$
 C) $\frac{45}{2}$
 D) $\frac{360}{7}$

$$x = a$$

$$g(a) = \left| \frac{7}{9}a - 40 \right| = a$$

$$\frac{7}{9}x - 40 = a \quad \text{① } a = -180$$

$$\frac{7}{9}x - 40 = -a \quad \checkmark$$

14

How many solutions does the equation $(x+1)(x-1) = x(x-1)$ have?

- A) Zero
 B) One
 C) Two
 D) Infinitely many

$$(x+1)(x-1) - x(x-1) = 0$$

$$(x-1)(x+1-x) = 0$$

$$(x-1) \cdot 1 = 0$$

$$x = 1$$

15

$$34x^2 = -68x^2$$

How many solutions does the given equation have?

- A) Zero
- ☒ B) Exactly one
- C) Exactly two
- D) Infinitely many

16

$$\frac{1}{3}(bx + c) = \frac{14}{27}x + \frac{4}{9}$$

In the given equation, b and c are constants and $c > 3$. The equation has no solution. What is the value of b ?

$$\frac{1x}{9}$$

17

$$(2x + 3)(ax - 5) = 12x^2 + bx - 15$$

In the given equation, a and b are constants. If the equation is true for all values of x , what is the value of b ?

- A) 6
- ☒ B) 8
- C) 10
- D) 12

18

The expression $5x^5 + 6x^4 - 8x^3$ can be rewritten as $(x^3 - hx^2)(5x^2 + 10x)$, where h is a constant. What is the value of h ?

$$\frac{4}{5}$$

19

$$18x^2 - 8 = 2(ax + b)(ax - b)$$

In the given equation, a and b are constants. If the equation is true for all values of x , which of the following could be the value of ab ?

- ☒ A) 6
- B) 9
- C) 12
- D) 36

20

The expression $(x + a)(x + 6)$, where a is a constant, is equivalent to $x^2 + bx + c$, where b and c are positive integer constants. Which of the following must be an integer?

- ☒ A) $\frac{c}{6}$
- B) $\frac{b}{a}$
- C) $\frac{c}{b}$
- D) $\frac{6}{a}$

21

$$4x^2 + mx + 9 = (2x + n)^2$$

In the given equation, m and n are constants and $n < 0$. If the equation is true for all values of x , what is the value of $m + n$?

- ☒ A) -15
- B) -9
- C) -3
- D) 12

EXERCISE 2: Answers for this exercise start on page 330.

1

The function $g(x) = 0.002x^2 + 5x$ models the revenue, in dollars, generated by an online advertisement that is clicked half as many times as it is viewed, where x is the number of times it is viewed. Which of the following is the best interpretation of $g(2,000) = 18,000$ in this context?

- A) If the advertisement is clicked 2,000 times, then it will generate 18,000 dollars in revenue.
- ☒ B) If the advertisement is viewed 2,000 times, then it will generate 18,000 dollars in revenue.
- C) If the advertisement is viewed 18,000 times, then it will generate 2,000 dollars in revenue.
- D) If the advertisement is clicked 18,000 times, then it will generate 2,000 dollars in revenue.

2

The function f is defined by $f(x) = \frac{x+18}{x-6}$. For what value of x does $f(x) = -1$?

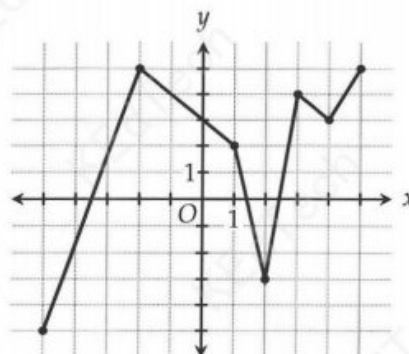
-6

3

Function g is defined by $g(x) = \sqrt{3x}$. If $g(a) = 6$, what is the value of a ?

- A) 3
- B) 6
- C) 9
- ☒ D) 12

4



The graph of $y = f(x)$ is shown in the xy -plane. For how many values of x does $f(x) = 3$?

- A) Two
- B) Three
- ☒ C) Four
- D) Five

5

The function f is defined by $f(x) = \frac{a^{-x}}{b}$, where a and b are positive constants. What is the y -intercept of the graph of $y = f(x)$ in the xy -plane?

- ☒ A) $(0, \frac{1}{b})$
- B) $(0, \frac{a}{b})$
- C) $(0, \frac{1}{ab})$
- D) $(0, 1)$