

7.4 Start Thinking

Rewrite the equation $(x + 3)(x + 5) = 0$ if $x + 3 = a$ and $x + 5 = b$. What do you know to be true about either the value of a or the value of b ? Explain what this tells you about the original equation.

Use your knowledge of the Zero-Product Property to write and solve two separate equations from the original equation. Explain the significance of the solutions obtained.

7.4 Warm Up

Solve.

1. $x + 4 = -9$

2. $\frac{4}{3}x = -8$

3. $\frac{1}{2}x = -16$

4. $x - 2 = 25$

5. $\frac{1}{3}x = 11$

6. $x - 4 = 8$

7.4 Cumulative Review Warm Up

Solve the inequality. Graph the solution.

1. $-7t > 14$

2. $-12 \leq -z$

3. $\frac{n}{-4} \leq 2$

4. $-10 > -\frac{2}{3}m$

5. $12 \geq 6f$

6. $t - 8 \geq 36$

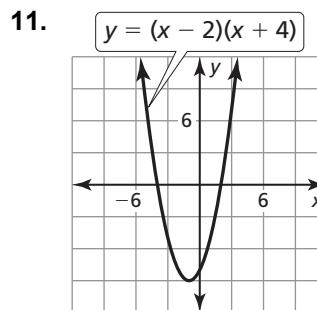
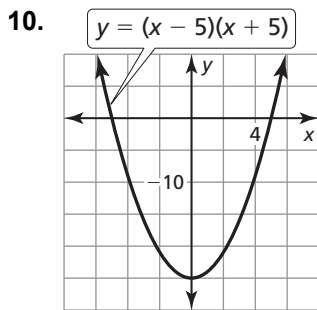
7.4

Practice A

In Exercises 1–9, solve the equation.

1. $x(x - 5) = 0$
2. $6d(d + 8) = 0$
3. $-3t(t + 7) = 0$
4. $(3x + 6)(2x - 10) = 0$
5. $(p + 3)(5p + 1) = 0$
6. $(3q + 2)^2 = 0$
7. $(y - 10)^2 = 0$
8. $t(t + 4)(t - 5) = 0$
9. $7u(u - 9)(2u - 5) = 0$

In Exercises 10 and 11, find the x -coordinates of the points where the graph crosses the x -axis.



In Exercises 12–14, factor the polynomial.

12. $4t^2 + 12t$
13. $10k^3 - 15k^2$
14. $8x^3 - 20x^2$

In Exercises 15–17, solve the equation.

15. $3t^2 - t = 0$
16. $5y^2 + 10y = 0$
17. $21n + 12n^2 = 0$

18. Describe and correct the error in solving the equation.

$$\begin{aligned} \times \quad & 15t^2 + 5t = 0 \\ & 5t(3t) = 0 \\ & 5t = 0 \text{ and } 3t = 0 \\ & t = 0 \quad t = 0 \end{aligned}$$

19. The height y of a jumping frog can be modeled by $y = -16x^2 + 4x$, where x is the time (in seconds) since the frog jumped from the ground. Find the roots of the equation when $y = 0$. Explain what the roots mean in this situation.

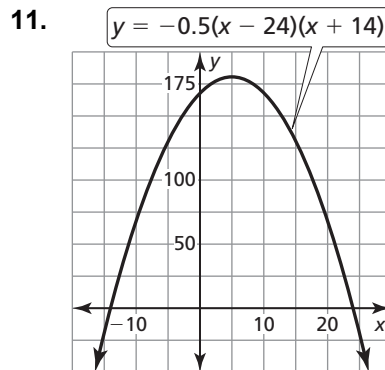
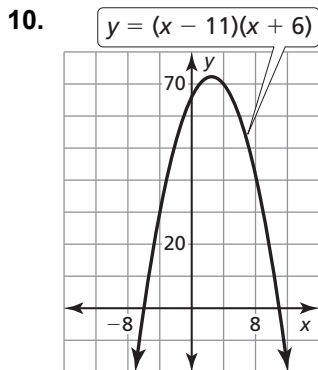
7.4

Practice B

In Exercises 1–9, solve the equation.

- | | |
|--|------------------------------------|
| 1. $-3y(y - 4) = 0$ | 2. $(d - 6)(d + 1) = 0$ |
| 3. $(w + 3)(w - 5) = 0$ | 4. $(2 - 3x)(2 + 3x) = 0$ |
| 5. $9h(h - 4)(3h + 2) = 0$ | 6. $k(k + 2)^2 = 0$ |
| 7. $(y - 7)^2(y + 9) = 0$ | 8. $(12 - 4n)(3n - 5)(-n + 2) = 0$ |
| 9. $(5 - n)\left(3 - \frac{1}{2}n\right)(n - 4) = 0$ | |

In Exercises 10 and 11, find the x -coordinates of the points where the graph crosses the x -axis.



In Exercises 12–14, factor the polynomial.

- | | | |
|-------------------|-------------------|-------------------|
| 12. $36v^2 + 24v$ | 13. $3r^6 - 2r^5$ | 14. $18a^5 + 12a$ |
|-------------------|-------------------|-------------------|

In Exercises 15–17, solve the equation.

- | | | |
|----------------------|------------------|-------------------|
| 15. $16h^2 - 8h = 0$ | 16. $4w^2 = 12w$ | 17. $-32n = 8n^2$ |
|----------------------|------------------|-------------------|

18. Describe and correct the error in solving the equation.

~~$$15t^2 = 5t$$

$$3t = 1$$

$$t = \frac{1}{3}$$~~

 The root is $t = \frac{1}{3}$.

19. Write a polynomial of degree 3 whose only roots are $x = 2$ and $x = \frac{2}{5}$. Is there another polynomial of degree 3 that has the same roots?

7.4 Enrichment and Extension

Long Division of Polynomials

Example: Divide $(x^2 - 3x + 5)$ by $(x + 1)$.

Use the rule of long division to divide polynomials.

$$\begin{array}{r}
 x - 4 + \frac{9}{x + 1} \\
 x + 1 \overline{)x^2 - 3x + 5} \\
 \underline{-(x^2 + x)} \qquad \text{Multiply } x \text{ by } x + 1. \\
 -4x + 5 \qquad \text{Subtract binomial and carry down the 5.} \\
 \underline{-(-4x - 4)} \qquad \text{Multiply } -4 \text{ by } x + 1. \\
 9 \qquad \text{Subtract binomial to find remainder.}
 \end{array}$$

In Exercises 1–8, divide by using long division.

1. $(x^2 + 5x + 2) \div (x - 1)$
2. $(2x^2 - x + 3) \div (x - 4)$
3. $(x^2 - 5x) \div (x - 3)$
4. $(x^2 - 7x + 10)(x - 2)^{-1}$
5. $(4x^2 + 6x + 1) \div (2x - 3)$
6. $(x^2 - 4)(x + 3)^{-1}$
7. $(x^3 + x^2 - 4x + 5) \div (x - 2)$
8. $(x^3 + 5x + 3) \div (x - 2)$



Puzzle Time

Did You Hear About The ...

A	B	C	D	E	F
G	H	I	J	K	L
M	N	O	P	Q	

Complete each exercise. Find the answer in the answer column. Write the word under the answer in the box containing the exercise letter.

0, 9 THAT	<p>Solve the equation.</p> <p>A. $y(y + 6) = 0$ B. $s(s - 9) = 0$</p> <p>C. $11w(w - 4) = 0$ D. $-2u(u + 2) = 0$</p> <p>E. $(5r + 3)(r + 1) = 0$ F. $(j - 7)^2 = 0$</p> <p>G. $(8 - 16d)(8 + 16d) = 0$</p> <p>H. $4p(3p - 1)(p + 12) = 0$</p> <p>I. $b(b - 5)^2 = 0$</p> <p>J. $(18 - 2e)(2e + 10)(-e + 15) = 0$</p> <p>K. $(12 - m)\left(9 + \frac{3}{4}m\right)(m - 12) = 0$</p> <p>L. $6q^2 + q = 0$ M. $48a + 20a^2 = 0$</p> <p>N. $7n^2 = 49n$ O. $16t^2 - 32t = 0$</p> <p>P. $77c - 7c^2 = 0$</p> <p>Q. The archway to the entrance of an art gallery can be modeled by $y = -\frac{1}{3}(x - 5)(x + 5)$, where x and y are measured in feet. The x-axis represents the floor. Find the width of the arch at floor level.</p>	-2, 0 SO
0, 2 OF		$-\frac{1}{6}, 0$ KEPT
-5, 9, 15 THE		$-\frac{1}{2}, \frac{1}{2}$ A
7 DURING		10 TRIP
$-\frac{12}{5}, 0$ A		-6, 0 HORSE
0, 4 WAS		0, 7 DIARY
-12, 12 JOCKEY		0, 5 THAT
-12, 0, $\frac{1}{3}$ RACE		-1, $-\frac{3}{5}$ SLOW
0, 11 THE		-14, 14 PENCIL