Checkpoint: Assess Your Understanding, pages 197–199

3.1

1. Multiple Choice Which expression is the factored form of $3x^2 + 11x - 4$?

A. $(3x + 4)(x - 1)$ **B.** $(3x + 1)(x - 4)$

C. $(3x - 1)(x + 4)$ **D.** $(3x - 4)(x + 1)$

2. Factor.

a) $36x^2 - 49y^2$

$= (6x)^2 - (7y)^2$
$= (6x + 7y)(6x - 7y)$

b) $0.5x^2 - 3.5x + 5$

$= 0.5(x^2 - 7x + 10)$
$= 0.5(x - 2)(x - 5)$

c) $10x^2 + 29x - 21$

$= 10x^2 + 35x - 6x - 21$

$= 5x(2x + 7) - 3(2x + 7)$

$= (5x - 3)(2x + 7)$

d) $\frac{1}{5}x^2 - \frac{1}{180}y^2$

$= \frac{1}{5}\left(x^2 - \frac{1}{36}y^2\right)$

$= \frac{1}{5}\left(x + \frac{1}{6}y\right)\left(x - \frac{1}{6}y\right)$

3. Factor.

a) $(7x + 4)^2 - (3y - 2)^2$

$= [(7x + 4) + (3y - 2)][(7x + 4) - (3y - 2)]$
$= [7x + 4 + 3y - 2][7x + 4 - 3y + 2]$
$= (7x + 3y + 2)(7x - 3y + 6)$

b) $3(2x - 1)^2 + 14(2x - 1) + 8$

$= [3(2x - 1) + 2][(2x - 1) + 4]$
$= (6x - 3 + 2)(2x - 1 + 4)$
$= (6x - 1)(2x + 3)$

4. Determine whether $2x - 5$ is a factor of each polynomial.

a) $10x^2 + 23x - 5$

Write the trinomial as:
$(2x - 5)(5x + b)$
$= 10x^2 + (2b - 25)x - 5b$
Equate constant terms.
$-5b = -5$, so $b = 1$
Check:
$(2x - 5)(5x + 1)$
$= 10x^2 - 23x - 5$
So, $2x - 5$ is not a factor.

b) $6x^2 - 17x + 5$

Write the trinomial as:
$(2x - 5)(3x + b)$
$= 6x^2 + (2b - 15)x - 5b$
Equate constant terms.
$-5b = 5$, so $b = -1$
Check:
$(2x - 5)(3x - 1)$
$= 6x^2 - 17x + 5$
So, $2x - 5$ is a factor.

3.2

5. Multiple Choice Which values of x are solutions of $3x^2 + 2x = 8$?

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

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

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

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

6. Solve by factoring, then verify each solution.

a) $x^2 - 8x - 33 = 0$

$(x - 11)(x + 3) = 0$
Either $x - 11 = 0$,
then $x = 11$;
or $x + 3 = 0$, then $x = -3$

b) $8x^2 + 22x - 21 = 0$

$(2x + 7)(4x - 3) = 0$
Either $2x + 7 = 0$,
then $x = -3.5$; or
$4x - 3 = 0$, then $x = 0.75$

7. Solve each equation.

a) $(x - 2)(x + 3) = 24$

$x^2 + x - 6 - 24 = 0$
$x^2 + x - 30 = 0$
$(x - 5)(x + 6) = 0$
Either $x - 5 = 0$, then $x = 5$;
or $x + 6 = 0$, then $x = -6$

b) $5x^2 - 20x = x^2 + 8x - 49$

$5x^2 - 20x - x^2 - 8x + 49 = 0$
$4x^2 - 28x + 49 = 0$
$(2x - 7)(2x - 7) = 0$
$2x - 7 = 0$, then $x = 3.5$

8. Solve each equation, then verify the solution.

a) $\sqrt{4x} + 3 = x$

$\sqrt{4x} = x - 3$
$(\sqrt{4x})^2 = (x - 3)^2$
$4x = x^2 - 6x + 9$
$0 = x^2 - 10x + 9$
$0 = (x - 9)(x - 1)$
Either $x - 9 = 0$, then $x = 9$;
or $x - 1 = 0$, then $x = 1$
I used mental math to verify.
$x \neq 1$; the root is $x = 9$

b) $\sqrt{2x - 7} + 5 = x$

$\sqrt{2x - 7} = x - 5$
$(\sqrt{2x - 7})^2 = (x - 5)^2$
$2x - 7 = x^2 - 10x + 25$
$0 = x^2 - 12x + 32$
$0 = (x - 4)(x - 8)$
Either $x - 4 = 0$, then $x = 4$;
or $x - 8 = 0$, then $x = 8$
I used mental math to verify.
$x \neq 4$; the root is $x = 8$

9. The diagonal of a rectangle is 17 cm long. The rectangle is 7 cm longer than it is wide. What are the dimensions of the rectangle?

Let the width of the rectangle be x centimetres.
Then the length of the rectangle, in centimetres, is: $x + 7$
Use the Pythagorean Theorem to write an equation.

$x^2 + (x + 7)^2 = 17^2$
$x^2 + x^2 + 14x + 49 - 289 = 0$
$2x^2 + 14x - 240 = 0$ Divide each term by 2.
$x^2 + 7x - 120 = 0$
$(x + 15)(x - 8) = 0$

Either $x + 15 = 0$ or $x - 8 = 0$
$x = -15$ $x = 8$

Since the width cannot be negative, the width is 8 cm, and the length is: $(8 + 7)$ cm, or 15 cm