Quiz Review Lessons 5.4, 5.5, 5.7 & 5.8

Key

Practice 5-4

Factoring Quadratic Expressions

Factor each expression completely.

1.) $3x^2+7x+2$

$(3x+1)(x+2)$

2.) $6y^2+7y-24$

$(3y+8)(2y-3)$

3.) $24x^4+10x^3-4x^2$

$2x^2(12x^2+5x-2)$

$2x^2(4x-1)(3x+2)$

4.) $16r^2-16r-12$

$4(4r^2-4r-3)$

$4(2r+1)(2r-3)$

5.) $9r^2-12r+4$

$(3r-2)(3r-2)$

6.) $9x^2-3x-2$

$(3x+1)(3x-2)$

7.) $3x^2+5xy-2y^2$

$(3x-y)(x+2y)$

8.) $4x^2-20x+25$

$(2x-5)(2x-5)$

9.) $16x^2 + 142x - 180$

$2(8x^2 + 71x - 90)$

$2(8x - 9)(x + 10)$

10.) $6x^3 + 37x^2 + 45x$

$x(6x^2 + 37x + 45)$

$x(3x + 5)(2x + 9)$

Practice 5-5

Quadratic Equations

Solve each equation by factoring or by taking square roots.

1. $x^2 - 18x - 40 = 0$

$(x + 2)(x - 20) = 0$

$x + 2 = 0$ or $x - 20 = 0$

$x = -2$ or $x = 20$

2. $16x^2 = 56x$

$16x^2 - 56x = 0$

$8x(2x - 7) = 0$

$8x = 0$ or $2x - 7 = 0$

$x = 0$ or $x = \frac{7}{2}$

3. $5x^2 = 15x$

$5x^2 - 15x = 0$

$5x(x - 3) = 0$

$5x = 0$ or $x - 3 = 0$

$x = 0$ or $x = 3$

4. $x^2 - 3x - 4 = 0$

$(x - 4)(x + 1) = 0$

$x - 4 = 0$ or $x + 1 = 0$

$x = 4$ or $x = -1$

5. $x^2 + 9x + 20 = 0$

$(x + 5)(x + 4) = 0$

$x + 5 = 0$ or $x + 4 = 0$

$x = -5$ or $x = -4$

6. $6x^2 + 9 = -55x$

$6x^2 + 55x + 9 = 0$

$(6x + 1)(x + 9) = 0$

$6x + 1 = 0$ or $x + 9 = 0$

$x = -\frac{1}{6}$ or $x = -9$

7. $(x + 5)^2 = 36$

$\sqrt{(x+5)^2} = \sqrt{36}$

$x + 5 = \pm 6$

$x = -5 \pm 6$

$x = -5 + 6 = 1$

$x = -5 - 6 = -11$

8. $2x^2 - 3x = 0$

$x(2x - 3) = 0$

$x = 0$ or $2x - 3 = 0$

$x = 0$ or $x = \frac{3}{2}$

9. $2x^2 + x - 10 = 0$

$(2x + 5)(x - 2) = 0$

$2x + 5 = 0$ or $x - 2 = 0$

$x = -\frac{5}{2}$ or $x = 2$

10. $-4x^2 + 3x = -1$

$0 = 4x^2 - 3x - 1$

$0 = (4x+1)(x-1)$

$4x+1=0$ or $x-1=0$

$x = -\frac{1}{4}$ or $x = 1$

11. $5x^2 - 6x + 1 = 0$

$(5x-1)(x-1)=0$

$5x-1=0$ or $x-1=0$

$x = \frac{1}{5}$ or $x = 1$

12. $3x^2 + 1 = -4x$

$3x^2+4x+1=0$

$(3x+1)(x+1)=0$

$3x+1=0$ or $x+1=0$

$x = -\frac{1}{3}$ or $x = -1$

Practice 5-7

Completing the Square

Complete the square.

1. $x^2 + 6x + \blacksquare$ 12 **2.** $x^2 - 7x + \blacksquare$ $\frac{49}{4}$ **3.** $x^2 + 12x + \blacksquare$ 36 **4.** $x^2 + 3x + \blacksquare$ $\frac{9}{4}$

Solve each quadratic equation by completing the square.

5. $x^2 + 12x + 4 = 0$

$x^2 + 12x = -4$

$12 \cdot \frac{1}{2} = 6$ $\quad x^2 + 12x + 36 = -4 + 36$

$(6)^2 = 36$ $\quad (x+6)^2 = 32$

$\sqrt{(x+6)^2} = \sqrt{32}$

$x + 6 = \pm\sqrt{32}$

$x = -6 \pm \sqrt{32}$

$x = -6 \pm 4\sqrt{2}$

6. $x^2 - x - 5 = 0$

$x^2 - x = 5$

$-1 \cdot \frac{1}{2} = -\frac{1}{2}$ $\quad x^2 - x - \frac{1}{4} = 5 + \frac{1}{4}$

$\left(-\frac{1}{2}\right)^2 = \frac{1}{4}$ $\quad \left(x - \frac{1}{2}\right)^2 = \frac{20}{4} + \frac{1}{4}$

$\left(x - \frac{1}{2}\right)^2 = \frac{21}{4}$

$\sqrt{\left(x - \frac{1}{2}\right)^2} = \frac{\sqrt{21}}{\sqrt{4}}$

$x - \frac{1}{2} = \pm\frac{\sqrt{21}}{2}$

$x = \frac{1}{2} \pm \frac{\sqrt{21}}{2}$

7. $\frac{3x^2}{3} = \frac{-12x}{3} - \frac{3}{3}$ $\quad x^2 = -4x - 1$

$x^2 + 4x = -1$

$4 \cdot \frac{1}{2} = 2$ $\quad x^2 + 4x + 4 = -1 + 4$

$(2)^2 = 4$ $\quad (x+2)^2 = 3$

$\sqrt{(x+2)^2} = \sqrt{3}$

$x + 2 = \pm\sqrt{3}$

$x = -2 \pm \sqrt{3}$

8. $\frac{4x^2}{4} = \frac{-2x}{4} + \frac{1}{4}$

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

$x^2 + \frac{1}{2}x = \frac{1}{4}$

$\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$ $\quad x^2 + \frac{1}{2}x + \frac{1}{16} = \frac{1}{4} + \frac{1}{16}$

$\left(\frac{1}{4}\right)^2 = \frac{1}{16}$ $\quad \left(x + \frac{1}{4}\right)^2 = \frac{4}{16} + \frac{1}{16}$

$\left(x + \frac{1}{4}\right)^2 = \frac{5}{16}$

$\sqrt{\left(x + \frac{1}{4}\right)^2} = \frac{\sqrt{5}}{\sqrt{16}}$

$x + \frac{1}{4} = \pm\frac{\sqrt{5}}{4}$

$x = -\frac{1}{4} \pm \frac{\sqrt{5}}{4}$

9. $\frac{3x^2}{3} = \frac{-6x}{3} + \frac{9}{3}$

$x^2 = -2x + 3$

$x^2 + 2x = 3$

$2 \cdot \frac{1}{2} = 1$

$(1)^2 = 1$

$x^2 + 2x + 1 = 3 + 1$

$(x+1)^2 = 4$

$\sqrt{(x+1)^2} = \sqrt{4}$

$x + 1 = \pm 2$

$x = -1 \pm 2$ → $x = 1$, $x = -3$

10. $\frac{2x^2}{2} + \frac{6x}{2} - \frac{7}{2} = \frac{0}{2}$

$x^2 + 3x = \frac{7}{2}$

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

$\left(\frac{3}{2}\right)^2 = \frac{9}{4}$

$x^2 + 3x + \frac{9}{4} = \frac{7}{2} + \frac{9}{4}$

$\left(x + \frac{3}{2}\right)^2 = \frac{14}{4} + \frac{9}{4}$

$\left(x + \frac{3}{2}\right)^2 = \frac{23}{4}$

$\sqrt{\left(x + \frac{3}{2}\right)^2} = \frac{\sqrt{23}}{\sqrt{4}}$

$x + \frac{3}{2} = \pm\frac{\sqrt{23}}{2}$

$x = \frac{-3}{2} \pm \frac{\sqrt{23}}{2}$

Practice 5-8

The Quadratic Formula

Evaluate the discriminant of each equation. Describe the nature of the roots (how many & whether they are real/imaginary) and the nature of the graph.

1. $y = x^2 + 10x - 25$

$(10)^2 - 4(1)(-25)$

$100 - (-100) = 200$

2 real irrational.

intersects x-axis twice

2. $y = 9x^2 - 24x$

$(-24)^2 - 4(9)(0)$

$576 - 0 = 576$

2 real rational.

intersects x-axis twice

3. $y = 4x^2 - 4x + 1$

$(-4)^2 - 4(4)(1)$

$16 - 16 = 0$

1 real

intersects x-axis once

vertex is x-int

4. $y = 4x^2 - 3x + 1$

$(-3)^2 - 4(4)(1)$

$9 - 16 = -7$

2 imag.

does not intersect x-axis

5. $y = x^2 + 3x + 4$

$(3)^2 - 4(1)(4)$

$9 - 16 = -7$

2 imag.

does not intersect x-axis

6. $y = -2x^2 + 3x - 5$

$(3)^2 - 4(-2)(-5)$

$9 - 40 = -31$

2 imag.

does not intersect x-axis

Solve each equation using the Quadratic Formula.

7. $x^2 = 3x + 2$ $\quad x^2 - 3x - 2 = 0$

$x = \frac{3 \pm \sqrt{(-3)^2 - 4(1)(-2)}}{2(1)}$

$= \frac{3 \pm \sqrt{9 - (-8)}}{2} = \frac{3 \pm \sqrt{9+8}}{2}$

$x = \frac{3 \pm \sqrt{17}}{2}$

8. $10x^2 - 23x + 12 = 0$

$x = \frac{23 \pm \sqrt{(-23)^2 - 4(10)(12)}}{2(10)}$

$= \frac{23 \pm \sqrt{529 - 480}}{20}$

$= \frac{23 \pm \sqrt{49}}{20} = \frac{23 \pm 7}{20}$

$x = \frac{23+7}{20} = \frac{30}{20} = \frac{3}{2}$ $\quad x = \frac{23-7}{20} = \frac{16}{20} = \frac{4}{5}$