# Math 150 Week-in-Review 5 Answer Key

1. (a) As $x \to \infty, y \to \infty$; As $x \to -\infty, y \to \infty$
   (b) As $x \to \infty, y \to -\infty$; As $x \to -\infty, y \to \infty$

2. (a) $x$-intercepts: $-2, 0, \frac{5}{2}$
   $y$-intercepts: 0
   End behavior: As $x \to \infty, y \to \infty$; As $x \to -\infty, y \to -\infty$
   Graph is positive (above $x$-axis) on $(-2, 0) \cup (\frac{5}{2}, \infty)$.
   Graph is negative (below $x$-axis) on $(-\infty, -2) \cup (0, \frac{5}{2})$.
   (b) $x$-intercepts: $-1, 1, 3$
   $y$-intercepts: $-3$
   End behavior: As $x \to \infty, y \to \infty$; As $x \to -\infty, y \to \infty$
   Graph is positive (above $x$-axis) on $(-\infty, -1) \cup (3, \infty)$.
   Graph is negative (below $x$-axis) on $(-1, 1) \cup (1, 3)$.

3. $Q(x) = 2x^3 + 4x^2 + 10x + 16$; $R(x) = 16x - 13$

4. $Q(x) = x^2 - 3x + 1$; $R(x) = -8$

5. $P(4) = 31$; (Use Remainder Theorem and synthetic division.)

6. Use synthetic division to show that remainder is 0. (You should get that $Q(x) = 2x^2 + 2x - 12$.)

7. Use synthetic division twice and show that the remainder is 0 both times. (The remaining quotient is $Q(x) = x^2 + x - 2$.)

8. (a) In increasing order: $\pm\frac{1}{9}, \pm\frac{2}{9}, \pm\frac{1}{3}, \pm\frac{4}{9}, \pm\frac{2}{3}, \pm 1, \pm\frac{4}{3}, \pm 2, \pm 4$
   (b) In increasing order: $\pm\frac{1}{3}, \pm\frac{2}{3}, \pm 1, \pm\frac{4}{3}, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12$

9. (a) Positive real: 3 or 1; Negative real: 1; Imaginary (not real): 0 or 2
   (b) Positive real: 0 or 2; Negative real: 0 or 2; Imaginary (not real): 0, 2, or 4

10. (a) $-1$
    (b) $-10 + 6\sqrt{3} + (6 + 10\sqrt{3})i$
    (c) $\dfrac{34}{29} + \dfrac{27}{29}i$

11. $x = \dfrac{1}{3} \pm \dfrac{\sqrt{2}}{3}i$

12. (a) Zeros: $-2, -1, 4$; $P(x) = (x + 2)(x + 1)(x - 4)$
    (b) Zeros: $-2, -\frac{2}{3}, 1 \pm \sqrt{3}$; $P(x) = 3(x + 2)(x + \frac{2}{3})(x - 1 - \sqrt{3})(x - 1 + \sqrt{3})$
    (c) Zeros: $-2, -1, 2, \frac{1}{2} \pm \frac{\sqrt{3}}{2}i$; $P(x) = (x + 2)(x + 1)(x - 2)(x - \frac{1}{2} - \frac{\sqrt{3}}{2}i)(x - \frac{1}{2} + \frac{\sqrt{3}}{2}i)$
    (d) Zeros: $-1, 2, 1 \pm i\sqrt{2}$; $P(x) = (x + 1)(x - 2)(x - 1 - i\sqrt{2})(x - 1 + i\sqrt{2})$

13. $x^4 - 6x^3 + 22x^2 - 30x + 13$

14. $5x^3 + 10x^2 + 45x + 90$