Midterm 2 Practice Answers

Open-Ended

1. (a) Domain: \((-\infty, \infty)\).
   Roots: \(x = \pm 1, -\frac{3}{2}, \frac{3}{2}\).
   \(y\)-intercept: \(y = -\frac{3}{2}\).

   ![Graph of a function with roots at \(x = \pm 1, -\frac{3}{2}, \frac{3}{2}\) and \(y\)-intercept at \(y = -\frac{3}{2}\).]

(b) Domain: \((-\infty, \infty)\).
   Roots: \(x = -2, -\frac{1}{3}, \frac{-3 \pm \sqrt{17}}{2}\).
   \(y\)-intercept: \(y = -\frac{4}{3}\).

   ![Graph of a function with roots at \(x = -2, -\frac{1}{3}, \frac{-3 \pm \sqrt{17}}{2}\) and \(y\)-intercept at \(y = -\frac{4}{3}\).]
2. (a) \( f(x) = 2(x - \frac{7}{4})^2 - \frac{81}{8} \)
(b) \( \left( \frac{7}{4}, -\frac{81}{8} \right) \)
(c) \( (0, -4) \)
(d) \( (4, 0), (-\frac{1}{2}, 0) \)

3. (a) \( f(x) = -\frac{2}{5}x + \frac{50}{3} \)
(b) \( f(x) = -\frac{1}{4}x + \frac{75}{4} \)

4. (a) \( p(x) = (x + 4)^2(x + 2)^2(x - 1)^2(x - 3) \)
(b) \( p(x) = -\frac{1}{8}(x + 4)^2(x + 2)^2(x - 1)(x - 3) \)
(c) \( p(x) = -(x + 4)^3(x + 2)^2(x - 1)(x - 3) \)
(d) \( p(x) = \pi(x + 4)(x + 2)(x - 1)(x - 3)(x^2 + 1)(x^4 + 2) \)

5. \( w = \frac{3 \pm \sqrt{13}}{4} \)

6. (a) i) \( f(x) = \frac{1}{x} \); ii) Shift right three units, reflect over y-axis, scale vertically by a factor of 2, shift up one unit.
(b) i) \( f(x) = x^4 \); ii) Scale vertically by a factor of \( \frac{3}{4} \), shift up \( \frac{2}{3} \) units.
(c) i) \( f(x) = \frac{1}{x^2} \); ii) Shift left 2 units, scale horizontally by a factor of 3, reflect over x-axis.
(d) i) \( f(x) = x^3 \); ii) Scale vertically by a factor of 0.2, reflect over x-axis, shift down 6 units.

7. \( q = -2 \) or \( q = 3 \)

8. (a) -1
(b) -33
(c) 12
(d) 11
(e) \( \frac{c^2 + c - 42}{c(c - 8)} \)
(f) \( 8a^2 + 24 \)

9. (a) odd
(b) negative
(c) -3, 0, 2, 4
(d) 5
(e) \( f(x) = -0.03x(x + 3)(x - 2)(x - 4)^2 \)

10. Approximately 8.09 seconds.

11. 200 strollers for a maximum profit of $110,000.

12. (a) At approximately 0.312 meters and 8.022 meters.
(b) \( \sqrt{\frac{5}{52}} \). The largest survival rate a seedling can expect is \( \sqrt{\frac{5}{52}} \), or approximately 39.5\% chance of survival.
True/False

1. False
2. True
3. True

Multiple Choice

1. (b)