Key Concepts Review Chapter 1

1. Solve an equation for one variable in terms of another.
   a) Solve for \(x\): \(a - 2[b - 3(c - x)] = 6\)
   b) Solve for \(a\):
      \[
      \frac{a + 1}{b} = \frac{a - 1}{b} + \frac{b + 1}{a}
      \]
   c) Solve for \(i\):
      \[
      A = P \left(1 + \frac{i}{100}\right)^2
      \]
   d) Solve for \(r\):
      \[
      aS - r = 0
      \]
   e) Solve for \(c\):
      \[
      s = \frac{a}{1-r}
      \]

2. Solve a quadratic equation. (Simplify your answers.)
   a) \(3x^2 - 12x - 1 = 0\)
   b) \(5x = 2x^2 + 1\)
   c) \(2x^2 + 12x + 1 = 0\)
   d) \(2x^2 + 4x + 3 = 0\)
   e) \(x^2 + 10 = -6x\)

3. Simplify an expression involving complex numbers. (Express answers in the form \(a + bi\).)
   a) \((2 - \sqrt{2})(\sqrt{8} - \sqrt{4})\)
   b) \((1 - \sqrt{3})(2 + \sqrt{4})\)
   c) \(\frac{1 - \sqrt{-1}}{1 + \sqrt{-1}}\)
   d) \(\frac{2 + \sqrt{-8}}{1 + \sqrt{-2}}\)
   e) \((2 - \sqrt{-36})^{-1}\)

4. Solve an equation by factoring.
   a) \(x^6 + 9x^4 - 4x^2 - 36 = 0\)
   b) \(2(x - 4)^\frac{1}{2} - (x - 4)^\frac{3}{4} - (x - 4)^\frac{1}{2} = 0\)
   c) \(x^{\frac{1}{2}} - 3x^{\frac{1}{3}} = 3x^{\frac{1}{6}} - 9\)
   d) \(x^{\frac{1}{2}} + 3x^{\frac{3}{2}} = 10x^{\frac{1}{2}}\)
   e) \(x^2\sqrt{x + 3} = (x + 3)^\frac{3}{2}\)

5. Solve a rational inequality. (Express answers using interval notation.)
   a) \(\frac{x}{x + 2} \leq \frac{1}{x}\)
   b) \(\frac{2x + 5}{x + 1} \leq 1\)
   c) \(\frac{9}{x} < x\)
   d) \(\frac{3}{x - 1} - \frac{x}{x + 1} \geq 1\)
   e) \(-3 \leq \frac{x + 1}{x - 3}\)

6. Solve an inequality involving absolute value.
   a) \(3 - |2x + 4| \leq 1\)
   b) \(4|3 - x| + 3 \geq 15\)
   c) \(2\left|\frac{x + 3}{2}\right| + 3 \leq 51\)
   d) \(\left|\frac{x + 1}{2}\right| > 6\)
   e) \(\left|\frac{x - 2}{3}\right| < 2\)