1. A function \( f \) is continuous at \( a \) if and only if the following three conditions are met:
   (a) \( f(a) \) exists.
   (b) \( \lim_{x \to a} f(x) \) exists.
   (c) \( \lim_{x \to a} f(x) = f(a) \).

2. A polynomial function is continuous at every point.

3. Discontinuities of a Rational Function:
   A rational function is discontinuous at points where the denominator is 0 and is continuous otherwise. Thus, a rational function is continuous on its domain.

   Examples:
   (a) Determine whether the function \( f(x) = \frac{x - 3}{x^2 - 9} \) is continuous at 3 and at -3.
   (b) Determine whether the function \( f(x) = \begin{cases} x + 2 & \text{if } x \geq 2 \\ x^2 & \text{if } x < 2 \end{cases} \) is continuous at 2 and at 0.
   (c) Find all points of discontinuity of each function:
      (1) \( f(x) = \frac{x^2 + 3x - 4}{x^2 - 4} \)
      (2) \( f(x) = \frac{x^4}{x^4 - 1} \)
      (3) \( f(x) = \begin{cases} 16x^2 & \text{if } x \geq 2 \\ 3x - 2 & \text{if } x < 2 \end{cases} \)

4. If \( f(x) \) is continuous \((a, b)\) and \( f(x) \neq 0 \) for all \( x \) in \((a, b)\), then either \( f(x) > 0 \) for all \( x \) in \((a, b)\) or \( f(x) < 0 \) for all \( x \) in \((a, b)\).

   Examples:
   (a) Solve the inequality \( 14 - 5x - x^2 < 0 \).
   (b) Solve the inequality \( \frac{x^2 + 4x - 5}{x^2 + 3x + 2} \leq 0 \).
   (c) Solve the inequality \( \frac{2}{x - 1} \geq \frac{x}{x + 2} \).

Exercises Do Problems 10.3, 10.4.