**Instructions** Test #1 will be Monday, September 27, 2004. The test covers the following sections in the text: §§2.1-2.6; §§3.1,3.2. The following are a selection of problems from the material to be covered on the test. These problems do not represent the entirely of the types of problems that may appear on the test. Solve these problems, ideally, without reference to your text.

1. True or False. Insert a T (for True) or a F (for False) into the blanks below in response to each of the assertions.

   (a) _____ If \( f \) is continuous at \( x = a \), then \( f \) must have a tangent line at \((a, f(a))\).

   (b) _____ If \( a \) is not in the domain of the function \( f \), then \( \lim_{x \to a} f(x) \) cannot exist.

   (c) _____ The function \( f(x) = \begin{cases} x^2 - 1 & x < -2 \\ 1 - 2x & x \geq -2 \end{cases} \) has a jump discontinuity at \( x = -2 \)

2. Use the precise definition of limit to prove that \( \lim_{x \to -1} (4x - 3) = -7 \).

3. Compute the limit of each of the following.

   (a) \( \lim_{x \to -1} \frac{2x^3 - 3x - 4}{2 - 3x} \)

   (b) \( \lim_{x \to 1} \frac{x - 1}{x^2 - 3x + 2} \)
(c) \( \lim_{t \to 9} \frac{9 - t}{3 - \sqrt{t}} \)

(d) \( \lim_{x \to 3^-} \frac{4x^2 - 2}{3 - x} \)

4. Let \( f(x) = \begin{cases} 3x - 2 & x \leq -2 \\ 4x^2 & x > -2 \end{cases} \)

   (a) Compute \( \lim_{x \to -2^+} f(x) \)

   (b) Compute \( \lim_{x \to -2^-} f(x) \)

   (c) Is the function \( f \) continuous at \( x = -2 \)? Explain.

5. Let \( f(x) = x^3 - 3x^2 \). Given that \( f'(x) = 3x^2 - 6x \), find the equation of the line tangent to the graph of \( f \) at the point (on the graph) corresponding to \( x = -2 \).

6. Let \( y = f(x) \) be a function and let \( a \) be in \( \text{Dom}(f) \). Give the definition of the derivative of \( f \) at \( x = a \), which is denoted \( f'(a) \).
7. Let \( f(x) = \frac{4}{x} \). Compute the value of \( f'(x) \) from the definition of derivative.

8. Let \( f(x) = \sqrt{x} \). Compute \( f'(4) \) using the definition of derivative.

9. A ball is thrown into the air with a velocity of 40 ft/s, its height in feet after \( t \) seconds is given by \( f(t) = 40t - 16t^2 \). Find the instantaneous velocity of the ball when \( t = 1 \).