1. Find each of the following limits, if it exists. If the limit does not exist, write DNE.
   a. \( \lim_\limits{x \to 3} \frac{x^3 - x - 2}{x^2 - 2x} \)
   b. \( \lim_\limits{x \to 0} \frac{x^3 - x}{\sin x} \)
   c. \( \lim_\limits{x \to 0} \frac{x}{|x| - 1} \)
   d. \( \lim_\limits{x \to 1^-} \frac{x - 1}{2x^2 - 3} \)
   e. \( \lim_\limits{x \to \infty} x^2 + x + 1 \)
   f. \( \lim_\limits{x \to \infty} \sin x \)
   g. \( \lim_\limits{x \to \infty} e^{-x} \)

2. Consider the graph of \( f(x) = \begin{cases} -1 - x, & \text{for } x < -1 \\ 1, & \text{for } -1 \leq x < 0 \\ 1 - x, & \text{for } 0 \leq x \end{cases} \).
   Find all values of \( x \) at which the following conditions hold.
   a. \( f \) is continuous but not differentiable at \( x = \)
   b. \( f \) has a discontinuity at \( x = \)
   c. State the limits from the left and from the right of \( f \) at the point in part b.

3. Let \( f(x) = \frac{1}{\sqrt{x}} \). Using the definition of derivative, calculate \( f'(x) \). (Some other likely functions: \( x^2, x^3, \sqrt{x}, \sqrt{x}, 1/x \) and \( 1/x^2 \))

4. Find the equation of the tangent line to the curve \( y = 1 - x^2 \) at (2,3).

5. Calculate \( \frac{dy}{dx} \) (you do not need to simplify the answer):
   a. \( y = \frac{x^2e^x}{3 - x} \)
   b. \( y = \frac{2 + x}{x} \)
   c. \( y = x \sin x + \tan x \)
   d. \( y = (x^4 + 1)^{1/2} + 17^{100} \)
   e. \( y = \ln(\cos x) \)

6. Let \( f(x) = x^3 - 3x^2 + 1 \).
   a. Find the critical numbers.
   b. Find the largest open intervals where the function is increasing.
   c. Find the relative maximum points (both \( x \) and \( y \) coordinates), if any.
   d. Find the relative minimum points (both \( x \) and \( y \) coordinates), if any.
   e. Answer (a)-(d) for \( g(x) = 3 - (x + 1)^{2/3} \).

7. Sketch the graph of \( f' \) given that the graph of \( f \) looks like this: