1. Assume the functions described below have both a first derivative and a second derivative everywhere. Answer each of the following using the appropriate response from POSITIVE, NEGATIVE, ZERO, or CANNOT DETERMINE
   a. If \( f \) is increasing at \( x=3 \), then
      \[ f'(3) = \quad f''(3) = \quad \]
   b. If \( f \) has a relative maximum at \( x=7 \), then
      \[ f'(7) = \quad f''(7) = \quad \]
   c. If \( f \) has a relative minimum at \( x=-6 \), then
      \[ f'(-6) = \quad f''(-6) = \quad \]
   d. If \( f \) is decreasing at \( x=32 \), then
      \[ f'(32) = \quad f''(32) = \quad \]
   e. If \( f \) has an inflection point at \( x=41 \), then
      \[ f'(41) = \quad f''(41) = \quad \]

2. Assume that \( f \) is differentiable everywhere and
   \[ f'(0) = \frac{8}{9} \quad f''(0) = -2 \quad f'(2) = \frac{1}{4} \]
   \[ f'(3) = 0 \quad f''(3) = -1 \quad f'(5) = -3 \]
   \[ f''(5) = 1 \quad f'(7) = 0 \quad f''(7) = \frac{5}{3} \]
   a. List two points where \( f \) is increasing.

   b. Where does \( f \) have a relative maximum?

   c. Where does \( f \) have a relative minimum?
3. Consider the function \( f(x) = 3x^2 + 12x - 36 \) on \([-10, 8]\)

a. Find where \( f \) is increasing and where \( f \) is decreasing.

b. Find where \( f \) is concave upward and where \( f \) is concave downward.

c. List all candidates for relative maxima and relative minima.

d. Determine:
   The relative maxima
   The relative minima
e. Find the line tangent to \( f \) at \( x=1 \).

4. Differentiate each of the following functions (ie: find the derivatives).

a. \( f(x) = x^5 - 3x^2 + 11 \)

b. \( f(x) = (5x^2 + 7x +6)^7 \)

c. \( f(x) = \frac{7}{x^3} \)

d. \( f(x) = x^3(5x^2 + 7x +6)^7 \)

e. \( f(x) = \frac{7}{x^3} \)
f. \( f(x) = x^3 \sin(x) \)

g. \( f(x) = \sin(x^3) \)

h. \( f(x) = \tan(x) \sec(x) \)

i. \( f(x) = \frac{(x^2+x)^4}{3x+1} \)

j. \( f(x) = \frac{6x^2-2x+7}{5x^2+4x+7} \)

k. \( f(x) = \left(\frac{x^2+1}{3x+7}\right)^3 \sin(4x) \)