1. Find \( \lim_{x \to 0} x^6 e^{\cos\left(\frac{1}{x}\right)} \).

2. There is something wrong with the following ‘proof’. What is it?

   Let \( f(x) = \frac{x^2-3x+2}{x-1} \). When \( x = 0 \), \( f(x) = -2 \). When \( x = 3 \), \( f(x) = 1 \).
   Therefore, by the Intermediate Value Theorem, \( f(c) = 0 \) for some \( c \) between 0 and 3.

3. For each of the following equations, find an interval on which it has a solution.
   (a) \( x^5 - 5x^3 + 3 = 0 \)
   (b) \( \frac{1}{1+x^2} = \frac{1}{4} \)
   (c) \( \sin(t) = \frac{1}{e} \)

4. Find the equation of the tangent line to the curve \( y = 3x^2 - 2x + 7 \) at the point \( (3, 28) \).

5. Use the definition to find the derivative of each of the following functions.
   (a) \( f(x) = mx + b \) for real numbers \( m, b \)
   (b) \( f(x) = ax^2 + bx + c \) for real numbers \( a, b, \) and \( c \)