1. Given \( f(x) = x^2 + 1 \) and \( g(x) = \sqrt{x - 2} \), find \( f \circ g \), \( g \circ f \) and their domains.

2. Determine the infinite limit \( \lim_{x \to 1} \frac{3 - x}{(x - 1)^2} \).

3. Evaluate the limit, if it exists. \( \lim_{x \to 4} \frac{x^2 - 4x}{x^2 - 3x - 4} \).

4. Prove that \( \lim_{x \to 0} x^2 \sin \frac{1}{x} = 0 \) using the Squeeze Theorem.

5. Prove that \( \lim_{x \to 2} \left( \frac{x}{2} + 1 \right) = 2 \) using the \( \varepsilon, \delta \) definition of limit.

6. Use the Intermediate Value Theorem to show that there is a root of the equation \( \sqrt{x} = 1 - x \) in the interval \((0, 1)\).

7. Find an equation of the tangent line to the curve at the given point. \( y = \frac{x - 1}{x - 2} \) at \((3, 2)\).

8. Find the derivative of the function \( f(x) = \frac{1}{2}x - \frac{1}{3} \) using the definition of derivative. No credits if you use other methods.

9. Differentiate \( y = \frac{x - x^3}{\sqrt{x}} \).

10. Differentiate \( y = \frac{\tan x}{\sec x + 1} \).