PRACTICE EXAM 1 - MATH 160
DATE: Friday, October 2
INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. Each question is worth 25 points. It is necessary to show your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. Consider the piece-wise defined function $f(x) = \begin{cases} -x + 2, & \text{if } x < 1 \\ -1, & \text{if } x = 1 \\ \sqrt{x}, & \text{if } x > 1 \end{cases}$

    (a) Plot the graph of $y = f(x)$. (10 points)

    (b) Compute $\lim_{x \to 1^-} f(x), \lim_{x \to 1^+} f(x), \lim_{x \to 1} f(x)$. (10 points)

    (c) Is f continuous at $x = 1$? **Explain**. (5 points)

2. (a) Provide the formula for the limit definition of the derivative of a function $f(x)$ at $x = a$. (5 points)

    (b) Set up the formula to find the derivative of $f(x) = \frac{1}{x-2}$ at $x = 4$ using the limit definition. (5 points)

    (c) Use the formula in part (b) to compute the derivative $f'(4)$ if $f(x) = \frac{1}{x-2}$. (15 points)

3. Consider the function $f(x) = \sqrt{2x + 3}$

    (a) Compute the derivative $f'(x)$. (8 points)

    (b) Find the slope of the tangent line to the graph of $y = f(x)$ at $x = 3$. (5 points)

    (c) Find an equation of the line that is perpendicular to the tangent line of part (b) and passes through the point on the graph of $y = f(x)$ at $x = 3$. (7 points)

    (d) Find the y-intercept of the line in part (c). (5 points)

4. Use the rules for computing derivatives to find $f'(x)$ if

    (a) $f(x) = \frac{2}{x^7}$ (5 points)

    (b) $f(x) = (x^2 - 5)(x^7 - 8x^5 + 4x^3)$ (5 points)

    (c) $f(x) = \frac{x+5}{x^2 - 7x + 13}$ (5 points)

    (d) $f(x) = (7x^2 - 3)^5$ (5 points)

    (e) $f(x) = \frac{(2x+5)^3}{x^2 + 7}$ (5 points)