MAT 1500 (Dr. Fuentes) Worksheet 5 - Sections 2.8, 3.1, & 3.2

Section 2.8: The Derivative as a Function

Problem 1.
(a) Show that $f(x) = x^{2/3}$ is not differentiable at $x = 0$.

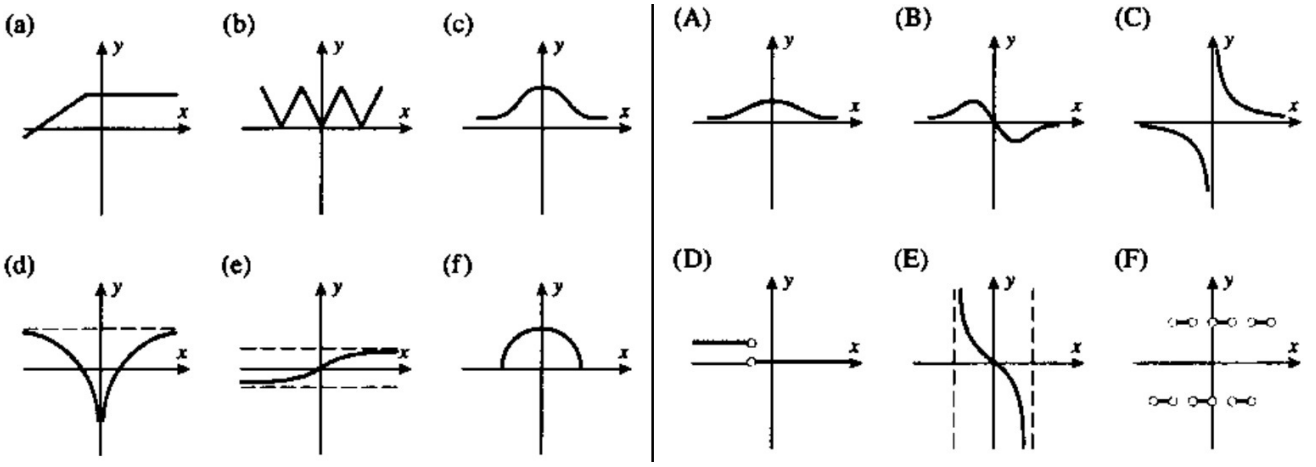
(b) Determine where the function $g(x) = x + |x|$ is not differentiable. Draw the graphs of g and g'.

Problem 2. Let

$$f(x) = \begin{cases} 0 & \text{if } x \leq 0 \\ 5 - x & \text{if } 0 < x < 4 \\ \dfrac{1}{5-x} & \text{if } x \geq 4 \end{cases}$$

(a) Where is f discontinuous?
(b) Find $f'(4)$, if it exists. If it does not exist, show why.
(a) Where is f differentiable?

Problem 3. Match the graphs of the functions in (a)-(f) with the graphs of their derivatives in (A)-(F).



Section 3.1: Derivatives of Polynomials & Exponential Functions

Problem 4. Find the point on the curve $y = 1 + 2e^x - 3x$ at which the tangent line is parallel to the line $3x - y = 5$.

Problem 5. Show that the curve $y = 2e^x + 3x + 5x^3$ has no tangent line with slope 2.

Section 3.2: The Product & Quotient Rules

Problem 6. Find $f'(x)$ and $f''(x)$ for $f(x) = \sqrt{x}e^x$.

Problem 7. Find the derivative of $y = \dfrac{x^2 e^x}{x^2 + e^x}$.