Math 131 - Study Session Problems

1 Left and Right Derivatives

Recall that the left and right derivative of f at $x = c$ are defined by

$f'_-(c) = \lim_{h \to 0^-} \frac{f(c+h)-f(c)}{h}$ and $f'_+(c) = \lim_{h \to 0^+} \frac{f(c+h)-f(c)}{h}$

Consider the following piecewise function f.

$$f(x) = \begin{cases} x^2 - x, & x < 2 \\ 2x - 6, & x \geq 2 \end{cases}$$

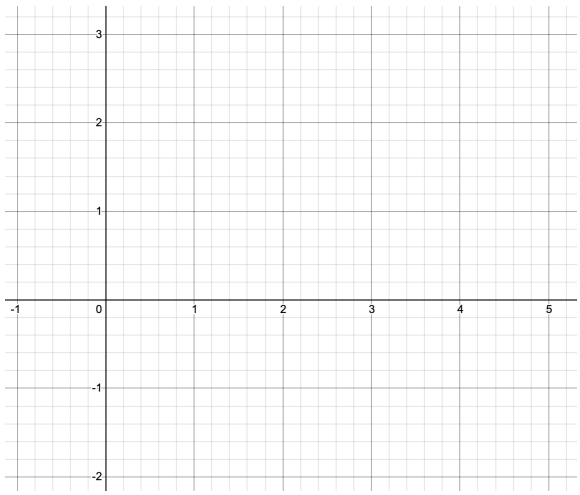
1. Use derivative rules to find a formula for $f'(c)$ when $c < 2$.

2. Use derivative rules to find a formula for $f'(c)$ when $c > 2$.

3. Find the equation of the tangent line to f at $x = 1$.

4. Calculate $f'_-(2)$ and $f'_+(2)$ and determine if f is differentiable at $x = 2$.

5. Sketch the graph of f' on the blank graph below.



2 Derivative Rules

1. Consider the function $p(x) = x^2 = x \cdot x$.

   (a) Use the power rule to find $p'(x)$.

   (b) Use the product rule to find $p'(x)$.

2. Consider the function $q(x) = \dfrac{x^2 + 3x + 4}{7}$

   (a) Use the power rule to find $q'(x)$.

   (b) Use the quotient rule to find $q'(x)$.

   (c) Explain why using the quotient rule is not necessary even though $q(x)$ is apparently a fraction.

3. Consider the function $r(x) = \dfrac{x^3 + 4x^2}{\sqrt{x}}$

   (a) Simplify the formula for $r(x)$, the use the power, sum, and constant multiple rules to find $r'(x)$.

   (b) Use the quotient rule to find $r'(x)$.

   (c) Simplify your above expressions to make sure you get the same answer using each method. Which method was the easiest?