SECTION 3-3: DERIVATIVE RULES

Goals: To establish and justify several derivative rules and use them and to learn some new notation. Just FYI but on Wednesday we will begin with a complete and comprehensive summary of *all* the rules from this section.

1. Use the definition to find the derivative of $f(x) = x^2$.

2. Recall that at the end of class on Friday we established:

3. Graph $f(x) = \cos(x)$ and use the same strategy to guess its derivative.

4. If $f(x) = 10$, what should $f'(x)$ be and why?

5. Make a conjecture about the derivative of constant functions and write it down.

6. If $f(x) = x$, what should $f'(x)$ be and why?

7. What about $f(x) = 5x$? Explain.

8. What about $f(x) = 5x + 10$? Explain.

9. In the 3.2 notes on the definition of the derivative, we found that if $f(x) = \sqrt{x+5}$, then its derivative was:

   Use this to determine the derivative of $g(x) = \sqrt{x}$.

10. The Power Rule

11. The Sum (and Difference) Rule

12. The Constant Multiple Rule

13. Apply the rules to find the derivatives of the functions below. Simplify your answers and write with positive exponents.

    (a) $f(x) = e^3$

    (b) $f(x) = x^{-4}$

    (c) $H(x) = 4x^{3/2} + 15$

    (d) $j(x) = \dfrac{\sqrt{2}}{2} + x - 8x^{2.3}$

14. Notation

15. Higher Order Derivatives

16. Find examples of $f(x)$ and $g(x)$ that demonstrate that the rules below are WRONG.

INCORRECT: If $H(x) = f(x)g(x)$, then $H'(x) = f'(x)g'(x)$.

INCORRECT: If $H(x) = \frac{f(x)}{g(x)}$, then $H'(x) = \frac{f'(x)}{g'(x)}$.

17. Product and Quotient Rules

(a) $\dfrac{d}{dx}\left[f(x)\,g(x)\right] =$

(b) $\dfrac{d}{dx}\left[\dfrac{f(x)}{g(x)}\right] =$