MA 181 SECTION 3.1: DERIVATIVES OF POLYNOMIAL & EXPONENTIAL FUNCTIONS

When the directions say: *FIND THE DERIVATIVE* or *DIFFERENTIATE* of a function y = f(x) this means to find the function y′ = f′(x) or dy/dx.

DERIVATIVE RULES:

1. Constant function: $f(x) = c$
   $f'(x) = 0.$

2. Linear function: $f(x) = mx + b$
   $f'(x) = m$

3. General Power Rule for power functions where n is any real number:

   $f(x) = x^n$
   $f'(x) = nx^{n-1}$

4. Constant Multiple Rule: $[cf(x)]' = cf'(x)$

5. Sum Rule: $[f(x) + g(x)]' = f'(x) + g'(x)$

6. Difference Rule: $[f(x) - g(x)]' = f'(x) - g'(x)$

7. Exponential function: $f(x) = a^x$
   $f'(x) = (\ln a)a^x$

   Note: When a = e, ln a = 1. If $f(x) = e^x$ then $f'(x) = e^x$.

EXAMPLES: Differentiate

A. $f(x) = 5x^8 - 2x^5 + 6$

B. $g(x) = 2e^x - 3x + \sqrt{5} + \pi + e$