

# Lecture 7 Activity: Basic Derivative Rules

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Math 3, Fall 2023

September 25, 2023

1. Compute derivatives of the following functions.
  - 1.1  $3x^{20} + 5e^x$ .
  - 1.2  $-5x^2 - 2x + 1$ .
  - 1.3  $\sqrt[3]{x}$ . (Remember:  $\sqrt[3]{x} = x^{1/3}$ .)
  - 1.4  $1/x$ . (Remember:  $1/x = x^{-1}$ .)
  - 1.5  $(5/x^2) + 6x$ . (Remember:  $1/x^2 = x^{-2}$ .)
2. Suppose  $f(x) = ax^2 + bx + c$  and that  $f(0) = 5$ ,  $f'(0) = 10$ , and  $f''(0) = -2$ .
  - 2.1 What are  $a$ ,  $b$ , and  $c$ ? (**Hint:** First, figure out how to write  $f'$  and  $f''$  in terms of  $a$ ,  $b$ , and  $c$ .)
  - 2.2 What are the  $x$  and  $y$  coordinates of the highest point on this parabola? (**Hint:** The highest point is where the slope is 0. Write down the equation  $f'(x) = 0$  and solve for  $x$ .)
3. How many functions have a derivative of 0? A derivative of  $x$ ? A derivative of  $x^2$ ?
4. **Challenge problem:** Use a graphing calculator to graph the function  $f(x) = x^3 - 4x^2 + 4x - 1$ . Notice that it has a local minimum and a local maximum. What are the  $x$ -coordinates of these two points?