Section 1.6: More on Derivatives

Goal: To have a set of easy rules to make differentiating functions a more mechanical process.

Derivative Rules:

1) $\frac{d}{dx}b = 0$ (b is a constant)

2) $\frac{d}{dx}(mx+b) = m$

3) $\frac{d}{dx}x^r = rx^{r-1} \quad (r \neq 0)$ [Power Rule]

4) $\frac{d}{dx}(k \cdot f(x)) = k \cdot \frac{d}{dx}(f(x))$ [Constant Multiple Rule]

5) $\frac{d}{dx}(f(x)+g(x)) = f'(x)+g'(x)$ [Sum Rule]

6) $\frac{d}{dx}(f(x)^r) = r \cdot f(x)^{r-1} \cdot f'(x)$ [General Power Rule]

Example: (#2, page 114)

Given:

$$y = x^3 + \frac{7}{x} = x^3 + 7 \cdot x^{-1}$$

Then

$$\frac{d}{dx} y = 3x^2 + 7 \cdot (-1) x^{-2}.$$

Example: (#4, page 114)

Given:

$$y = 2x^3 + 3$$

Then

$$\frac{dy}{dx} = 2 \cdot 3x^2 + 0 = 6x^2.$$

Example: (#14, page 114)

Given:

$$y = (x - \sqrt{x})^2 = (x - x^{1/2})^2$$

Then

$$y' = 2(x - x^{1/2})^1 \cdot \frac{d}{dx}(x - x^{1/2}) = 2(x - x^{1/2}) \cdot (1 - \frac{1}{2}x^{-1/2}).$$

Example: (variation of #34, page 114)

Given:

$$y = \frac{1}{(1 + x + x^2)^{11}} = (1 + x + x^2)^{-11}$$

Then

$$\frac{d}{dx}y = -11(1 + x + x^2)^{-12} \cdot \frac{d}{dx}(1 + x + x^2)$$

$$= -11(1 + x + x^2)^{-12} \cdot (0 + 1 + 2x).$$