Section 3.1

Derivative of a Constant Function: $\frac{d}{dx}(c) = 0$.

Exercise 1. Find $f'(x)$ for $f(x) = 4$.

Power Rule: Let n be an integer.

$$\text{If } f(x) = x^n \text{, then } f'(x) = nx^{n-1},$$

provided $x \neq 0$ when $n \leq 0$.

Exercise 2. Find $f'(x)$ for $f(x) = x^5$.

Power Rule (General Version): If n is any real number, then

$$\tfrac{d}{dx}(x^n) = nx^{n-1}.$$

Exercise 3. Find $f'(x)$ for $f(x) = x^{2/3}$.

Theorem

(i) $D_x c = 0$
(ii) $D_x(mx + b) = m$
(iii) $D_x(x^n) = nx^{n-1}$
(iv) $D_x[cf(x)] = cD_x f(x)$
(v) $D_x[f(x) + g(x)] = D_x f(x) + D_x g(x)$
(vi) $D_x[f(x) - g(x)] = D_x f(x)$ - $D_x g(x)$

Exercise 4. If $f(x) = 2x^4$ - $5x^3 + x^2$ - $4x + 1$, find $f'(x)$. (Swok Sec 3.3 Ex 1)

Class Exercise 1. Differentiate the function. (#8-14 even)
(a) $f(t) = 1.4t^5$ - $2.5t^2 + 6.7$ (b) $h(x) = (x - 2)(2x + 3)$
(c) $B(y) = cy^{-6}$ (d) $y = x^{5/3}$ - $x^{2/3}$

Exercise 5. Find an equation of the tangent line to the graph of $f(x) = 6\sqrt[3]{x^2} - \frac{4}{\sqrt{x}}$ at $P(1, 2)$. (Swok Sec 3.3 Ex 2)

Class Exercise 2. Find the equation of the tangent line to the graph of $f(x) = 2x^3 - x^2 + 2$ at the point $(1, 3)$.

Definition of the number e: e is the number such that $\lim_{h \to 0} \frac{e^h - 1}{h} = 1$.

Definition of the Natural Exponential Function: $\frac{d}{dx}(e^x) = e^x$.

Exercise 6. If $f(x) = 2e^x$, find $f'(x)$.

Class Exercise 3. Differentiate the function. (#16-28 even, 32)
(a) $h(t) = \sqrt[4]{t}$ - $4e^t$ (b) $y = \sqrt{x}(x - 1)$ (c) $S(R) = 4\pi R^2$ (d) $y = \frac{\sqrt{x} + x}{x^2}$
(e) $g(u) = \sqrt{2}u + \sqrt{3u}$ (f) $k(r) = e^r + r^e$ (g) $y = ae^v + \frac{b}{v} + \frac{c}{v^2}$ (h) $y = e^{x+1} + 1$

Homework: 3-19 (every 4th), 21-33 (every 4th), 37, 39