Section 3.2

Derivative Product Rule: If u and v are differentiable function at x, then so is their product uv, and

$$\frac{d}{dx}(uv) = u\frac{dv}{dx} + v\frac{du}{dx}.$$

Exercise 1. Find the derivative of the following functions. (Hass Sec 3.3 Ex 6)
(a) $y = \frac{1}{x}(x^2 + e^x)$ (b) $y = e^{2x}$ (c) $y = (x^2 + 1)(x^3 + 3)$

Class Exercise 1. Find the derivative of the following functions. (#4,10,12)
(a) $g(x) = \sqrt{x} \cdot e^x$ (b) $J(v) = (v^3 - 2v)(v^{-4} + v^{-2})$ (c) $f(z) = (1 - e^z)(z + e^z)$

Derivative Quotient Rule: If u and v are differentiable at x and if $v(x) \neq 0$, then the quotient u/v is differentiable at x, and

$$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}.$$

Exercise 2. Find the derivative of the following functions. (Hass Sec 3.3 Ex 8(a), 9)
(a) $y = \frac{t^2-1}{t^3+1}$ (b) $y = \frac{(x-1)(x^2-2x)}{x^4}$

Class Exercise 2. Find the derivative of the following functions. (#8,14,16,22,24)
(a) $G(x) = \frac{x^2-2}{2x+1}$ (b) $y = \frac{x+1}{x^3+x-2}$ (c) $y = \frac{t}{(t-1)^2}$
(d) $g(t) = \frac{t-\sqrt{t}}{t^{1/3}}$ (e) $f(x) = \frac{1-xe^x}{x+e^x}$

Definition: If f' has a derivative, it is denoted by f'' and is called the **second derivative** of f. Thus

$$f''(x) = D_x[f'(x)] = D_x[D_x f(x)] = D_x^2\, f(x).$$

Exercise 3. Find f''' for $f(x) = x^4 - 3x^3 + 6x^2$.

Class Exercise 3. Find f'''' for $f(x) = x^5$ - $4x^3$ - 9.

Homework: 1, 3, 5, 11, 19, 23, 25, 29, 31