Section 3.4

How do we find the derivative of $f(x) = \cos(e^x)$?

Chain Rule: If $y = f(u)$, $u = g(x)$, and the derivatives dy/du and du/dx both exist, then the composite function defined by $y = f(g(x))$ has a derivative given by

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx} = f'(u)g'(x) = f'(g(x))g'(x).$$

Exercise 1. Find $\frac{dy}{dx}$ if $y = \sqrt{u}$ and $u = x^2 + 1$. (Swok Sec 3.6 Ex 1)

Exercise 2. Find $f'(x)$ if $f(x) = (x^5 - 4x + 8)^7$. (Swok Sec 3.6 Ex 2)

Exercise 3. Find $\frac{dy}{dx}$ if $y = \frac{1}{(4x^2+6x-7)^3}$. (Swok Sec 3.6 Ex 3)

Exercise 4. Find $f'(x)$ if $f(x) = \sqrt[3]{5x^2 - x + 4}$. (Swok Sec 3.6 Ex 4)

Class Exercise 1. Find dy/dx. (Waits Sec 3.6 #2-20 even)
(a) $y = \sin(7 - 5x)$ (b) $y = \tan(2x - x^3)$ (c) $y = (\sin x/(1 + \cos x))^2$ (d) $y = \sec(\tan x)$
(e) $y = (\csc x + \cot x)^{-1}$ (f) $y = x^3(2x - 5)^4$ (g) $y = 4\sqrt{\sec x + \tan x}$
(h) $y = \frac{x}{\sqrt{1+x^2}}$ (i) $y = (1+ \cos 2x)^2$ (j) $y = \sqrt{\tan\ 5x}$

Exercise 5. Using the fact that $a^x = e^{(\ln a)\ x}$, find $\frac{d}{dx}a^x$.

Exercise 6. Find $\frac{d}{dx}5^x$.

Class Exercise 2. For $y = 10^{1-x^2}$, find dy/dx.

Homework: 1, 5, 9, 17, 21, 23, 27, 31, 35, 39, 41, 45, 51, 55, 59