Chain Rule

Goal: • Can build chain rule from using a series of small changes • Can apply chain rule fluently
Terminology: • Chain Rule
Reminder: • Quiz on Thursday on derivative rules 3.3-3.6

Review:

1. Show that $\frac{d}{dx}\cos x = -\sin x$

2. State the 4 other trig derivatives

Function	Derivative
$\tan\theta$	
$\sec\theta$	
$\csc\theta$	
$\cot\theta$	

We are now going to look at the derivative of function compositions, that is if $y = f(x)$ and $u = g(x)$ then what can we say about the derivative of the composition

$$f(u) = f\big(g(x)\big)$$

Example: Given $f(u) = \tan u$ and $u = \sqrt{v}$ and $v = w^2 \cos w$, determine $\frac{df}{du}$, $\frac{df}{dv}$ and $\frac{df}{dw}$

Practice Problems: 3.6: # 1-38 (do what you need), 53, 54, 56, 57, 72  # 61, 67, 68
Look Ahead: Given the relation $x^2 = y^3 - y$ what is the slope at a given point?

In Class Evidence

53. What is the largest value possible for the slope of the curve $y = \sin\left(\frac{x}{2}\right)$?

56. Suppose the functions f and g and their derivatives have the following values at $x = 2$ and $x = 3$

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
2	8	2	$1/3$	-3
3	3	-4	2π	5

Evaluate the derivatives with respect to x of the following combinations

a. $g\big(f(x)\big)$ at $x = 2$

b. $f\big(x + g(x)\big)$ at $x = 3$

c. $f\left(\frac{f(x)}{g(x)}\right)$ at $x = 2$

61. The following is the temperature of a town in Alaska on day x (365 day year)

$$T = 37\sin\left[\frac{2\pi}{365}(x - 101)\right] + 25$$

a. On what day is the temperature increasing the fastest?

b. About how many degrees per day is the temperature increasing at its fastest?