2.4 The Chain Rule

- Find the derivative of a composite function using the Chain Rule.
- Find the derivative of a function using the General Power Rule.
- Simplify the derivative of a function using algebra.
- Find the derivative of a trigonometric function using the Chain Rule.

We've taken a lot of derivatives over the course of the last few sections. However, if you look back they have all been functions similar to the following kinds of functions.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	6	4	2	5
2	9	2	3	1
3	10	–4	4	2
4	–1	3	6	7

#1 $h(x) = 3(g(x))^3$;
Find $h'(2)$

$$h'(x) = 9(g(x))^2 \cdot g'(x)$$
$$h'(2) = 9(g(2))^2 g'(2)$$
$$= 9 \cdot 9 \; (1) = 81$$

#2 $t(x)=f(x)/g(x)$;
Find $t'(2)$

$$t'(2) = \frac{g(2)f'(2) - f(2)g'(2)}{(g(2))^2}$$
$$= \frac{(3)(2) - 9(1)}{9}$$

$-1/3$

#3 $p(x) = f(g(x))$;
Find $p'(2)$

$$p'(2) = f'(g(2)) \cdot g'(2)$$
$$= f'(3)(1)$$
$$= (-4)(1)$$
$$-4$$

$$(g(x))^3$$

$$f(g(x))$$

$$y = \sin 2x$$

$$y' = \cos 2x \cdot 2$$

95.) $y = \sin(x^2)$

$y' = \cos(x^2) \cdot 2x$

$y'' = \cos(x^2) \cdot 2 + 2x \cdot (-\sin(x^2) \cdot 2x$

$= 2\cos x^2 + -4x^2 \sin x^2$

73.) $y = 26 - (\sec 4x)^3 \qquad (0, 25)$

$y' = 0 - 3(\sec 4x)^2 \sec 4x \tan 4x \cdot 4$

$y' = -12 \sec^3 4x \tan 4x$

$y'(0) = 0$