

When you are done with your homework you should be able to...

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

Theorem: The Chain Rule

If $y = f(u)$ is a differentiable function of u and $u = g(x)$ is a differentiable function of x , then $y = f(g(x))$ is a differentiable function of x and

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx} \text{ or } \frac{d}{dx}[f(g(x))] = f'(g(x))g'(x).$$

Use the methods learned in 2.2 and 2.3 to evaluate the derivative of the following functions. Then find the derivative using the Chain Rule.

1. $y = (2 - x)^3$

"old way"

Chain Rule

2. $f(x) = \sin 2x$

"old way"

Chain Rule

$$3. \quad h(t) = \frac{\sqrt{t}}{\sqrt{t}-1}$$

"old way"

Chain Rule

Theorem: The General Power Rule

If $y = [u(x)]^n$, where u is a differentiable function of x and n is a rational number, then

$$\frac{dy}{dx} = n[u(x)]^{n-1} \cdot \frac{du}{dx} \quad \text{or} \quad \frac{d}{dx}[u^n] = nu^{n-1}u'.$$

4. Complete the table.

$y = f(g(x))$	$u = g(x)$	$y = f(u)$
$y = (8x^2 - 3)^{25}$		
$y = \tan \frac{\pi x}{3}$		
$y = \csc^2 x$		
$y = \frac{5}{\sqrt{x^2 + 6}}$		

Find the derivative of the following functions.

5.

a. $h(t) = \frac{1}{t}$

b. $h(t) = \frac{1}{t^2 + 2t - 1}$

6.

a. $y = \sec x$

b. $y = \sec 2x$

c. $y = \sec^2 x$

d. $y = \sec x^2$

7.

a. $y = x^5$

b. $y = (2x^3 - 5)^5$

8.

a. $y = \sqrt{x}$

b. $y = \sqrt{\cos x}$

9. $f(x) = x^2(2-x)^{2/3}$

10. $f(x) = \sqrt{\frac{1}{2x^3 + 15}}$

11. $h(x) = x \sin^2 4x$

12. $f(x) = \cot \sqrt[3]{x} - \sqrt[3]{\cot x}$

13. Find the equation of the tangent line at $t = 1$ for the function
 $s(t) = (9 - t^2)^{2/3}$.