


2.4 Composite Functions & the Chain Rule

ESSENTIAL QUESTION:

How is the Chain Rule used to find derivatives of composite functions?

Let $f(x) = \sin x$ and $g(x) = x^2$.

Then $f[g(x)] = f(x^2) = \sin x^2$.



nested function

The main (outside) function is the sine function.

The quadratic function x^2 is called the nested (inside) function.

The Chain Rule is the method we use to find the derivative of a composite function.

CHAIN RULE:

If $h(x) = f[g(x)]$,

then $h'(x) = f'[g(x)] \cdot g'(x)$.

Examples: Find the derivative of each function.

1. $y = (6x - 5)^4$

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

3. $y = \sin x^2$

4. $y = \sin^2 x$

5. $g(x) = \sqrt{2x+1} \cdot \cos \frac{3x}{2}$

6. $y = \sec^3(5x)$

7. $f(x) = \sqrt{\frac{2x}{x+1}}$

8. Show that there is a vertical tangent to

$$y = \frac{1}{x} + \sqrt{\cos x} \quad \text{at} \quad \left(\frac{\pi}{2}, \frac{2}{\pi} \right).$$

**We're all
done!**