TOPIC: THE CHAIN RULE

Intro to the Chain Rule

◆ To differentiate a composite function $f(g(x))$, start from the **outside** and work your way **inside**.

RULES OF DIFFERENTIATION		
Name	**Rule**	**Example**
Chain	$\frac{d}{dx}[f(g(x))] =$ _____(_____) · _____	$\frac{d}{dx}(4x+5)^3 =$ ___(_____) · ___

► Alternate notation: If $y = f(u)$ and $u = g(x)$, $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$.

EXAMPLE Find $f'(x)$ using the chain rule.

$f(x) = 2(3x^2 - x)^4$

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PRACTICE Find the derivative of the function.

$(\boldsymbol{A})$

$$f(x) = \sqrt{5x^2 - 3x}$$

$(\boldsymbol{B})$

$$y = (8x^3 - 2x)^{3/2}$$

$(\boldsymbol{C})$

$$f(t) = (3t^2 + 7t - 2)^{10}$$

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EXAMPLE Find $\frac{dy}{dx}$ for the function.

$(\boldsymbol{A})$

$$y = (2x - 1)^4 \cdot (3 + x)^2$$

$(\boldsymbol{B})$

$$y = \frac{(2x - 1)^4}{(3 + x)^2}$$