Product rule for derivative

y = *u v* $\frac{dy}{dx}=u\frac{dv}{dx}+v\frac{du}{dx}$

Find the derivative of each function

 1) By multiplying and then taking the derivative.

 2) By using the product rule.

 Example: y = 5x2( 4x + 1)

Method 1. Method 2

y = 5x2( 4x + 1) y = 5x2( 4x + 1)

$y=20x^{3}+5x^{2}$ $u=5x^{2}$ v = (4x + 1)

$\frac{dy}{dx}=60x^{2}+10x$ $\frac{du}{dx}=10x$ $\frac{dv}{dx}=4$

 $\frac{dy}{dx}=\left(5x^{2}\right)\left(4\right)+(4x+1)10x$

 $\frac{dy}{dx}=20x^{2}+40x^{2}+10x$

 $\frac{dy}{dx}=60x^{2}+10x$

Find the derivative of each function

 1) By multiplying and then taking the derivative.

 2) By using the product rule.

1. $y=12x^{3}(7x-10)$

2. $y=(4x-10)(6x^{2}-12)$

The Quotient Rule

y =$ \frac{u}{v}$ $\frac{dy}{dx}=\frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^{2}}$

Find the derivative of each using the quotient rule.

Example: $y=\frac{3x}{x^{2}-5}$

*u =* 3*x, v = x2 –* 5

$$\frac{du}{dx}=3, \frac{dv}{dx}=2x$$

$$\frac{dy}{dx}=\frac{\left(x^{2}-5\right)\left(3\right)-\left(3x\right)(2x)}{\left(x^{2}-5\right)^{2}}=\frac{3x^{2}-15-6x^{2}}{(x^{2}-5)^{2}}=\frac{-3x^{2}-15}{(x^{2}-5)^{2}}$$

Find the derivative of each using the quotient rule.

1. $y=\frac{6x-5}{2x-7}$

2. $y=\frac{8x-12}{5x^{2}-x}$