Unit 3: Product Rule and Quotient Rule

Name: ____________________________

The Product Rule: If both f and g are differentiable, then

$$(f \cdot g)'(x) = f(x) \cdot g'(x) + f'(x) \cdot g(x)$$

$$\frac{d}{dx}[f(x) \cdot g(x)] = f(x) \cdot \frac{d}{dx} g(x) + g(x) \cdot \frac{d}{dx} f(x)$$

$$= F \cdot S' + F' \cdot S$$

Examples:

1. $f(x) = (x^4 + 1)(2x^2 - 1)$

Power Rule

$f'(x) =$

Product Rule

$f'(x) =$

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2. $h(x) = (3x^4 + 5x^2 - 3)(6x^3 - 7)$

$h'(x) =$

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3. $g(x) = e^x x^3$

$g'(x) =$

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The Quotient Rule: If both f and g are differentiable, then

$$\left(\frac{f}{g}\right)'(x) = \frac{g(x)\cdot f'(x) - f(x)\cdot g'(x)}{[g(x)]^2} \qquad g(x) \neq 0$$

$$\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right) = \frac{g(x)\cdot \frac{d}{dx} f(x) - f(x)\cdot \frac{d}{dx} g(x)}{[g(x)]^2}$$

$$= \frac{B\cdot T' - T\cdot B'}{B^2} \qquad \text{OR} \qquad = \frac{low\cdot d(high) - high\cdot d(low)}{low\cdot low}$$

Examples:

4. $f(x) = \dfrac{3x+1}{x^2-1}$

$f'(x) =$

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5. $y = \dfrac{e^x}{x^3+1}$

$y' =$

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6. $h(x) = \dfrac{4x^3 - 5x + 3}{x^2}$

$h'(x) =$

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7. Given $F(x)$ find $F'(3)$ if $f(3)=7,\ f'(3)=2,\ g(3)=6,\ and\ \ g'(3)=-10$.

$F(x)=f(x)\cdot g(x)$

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8. Given $F(x)$ find $F'(5)$ if $g(5)=2,\ and\ \ g'(5)=-3$.

$F(x)=\left(3x^2-4x\right)\cdot g(x)$

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9. Suppose $f(6)=2,\quad f'(6)=3,\quad g(6)=4,\ and\ \ g'(6)=6$.

Find:

a) $(fg)'(6)$

b) $(f+g)'(6)$

c) $(\frac{f}{f-g})'(6)$

d) $\left(\frac{f}{g}\right)'(6)$

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10. If $h(x)=\frac{e^x}{g(x)}$, where g(0) = 2 and If $g'(0)=5$,, find If $h'(0)=$

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