AP Calculus AB
Product and Quotient Rule Notes

Name Key

Product & Quotient Rules

Product Rule:

The derivative of $f(x)g(x)$ is $f'(x)g(x)+f(x)g'(x)$

1. $f(x)=x^2e^x$

$f'(x)=2xe^x+x^2e^x$

$f'(x)=xe^x(2+x)$

2. $f(x)=2x^{1/2}(3x-1)$

$f'(x)=x^{-1/2}(3x-1)+(2x^{1/2})(3)$

$f'(x)=\frac{3x-1}{x^{1/2}}+6x^{1/2}$

3. $f(x)=(\frac{2}{3}x^3+6x-2)(4\sqrt{x}-6)$

$f'(x)=(2x^2+6)(4x^{1/2}-6)+(\frac{2}{3}x^3+6x-2)(2x^{-1/2})$

$f'(x)=(2x^2+6)(4x^{1/2}-6)+(\frac{2}{3}x^3+6x-2)(\frac{2}{x^{1/2}})$

Quotient Rule:

The derivative of $\frac{f(x)}{g(x)}$ is $\frac{f'(x)g(x)-f(x)g'(x)}{(g(x))^2}$

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

$f'(x)=\frac{(2x)(x^2-4)-(x^2+3)(2x)}{(x^2-4)^2}$

$f'(x)=\frac{2x^3-8x+[-2x^3-6x]}{(x^2-4)^2}$

$f'(x)=\frac{-14x}{(x^2-4)^2}$

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

$f'(x)=\frac{(1)(x^2+2x+2)-(x+1)(2x+2)}{(x^2+2x+2)^2}$

$f'(x)=\frac{x^2+2x+2+[-2x^2-2x-2x-2]}{(x^2+2x+2)^2}$

$f'(x)=\frac{-x^2-2x}{(x^2+2x+2)^2}=\frac{-x(x+2)}{(x^2+2x+2)^2}$

3. $f(x)=\left(\frac{x+4}{x+3}\right)(2x+5)=\frac{2x^2+13x+20}{x+3}$

$f'(x)=\frac{(4x+13)(x+3)+(-2x^2-13x-20)(1)}{(x+3)^2}$

$f'(x)=\frac{4x^2+12x+13x+39-2x^2-13x-20}{(x+3)^2}$

$f'(x)=\frac{2x^2+12x+19}{(x+3)^2}$

4. $f(x)=\frac{x^2+c^2}{x^2-c^2}$ * c is a constant

$f'(x)=\frac{(2x)(x^2-c^2)-(x^2+c^2)(2x)}{(x^2-c^2)^2}$

$f'(x)=\frac{2x^3-2c^2x+[-2x^3-2c^2x]}{(x^2-c^2)^2}$

$f'(x)=\frac{-4c^2x}{(x^2-c^2)^2}$