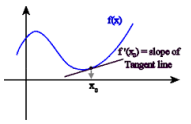
10/20/16
Aim: The quotient rule
HW: Complete the worksheet



Do Now

Please start the daily quiz (answer questions 1-4)

0:05:00

Oct 13-2:28 PM

How did you do?

Differentiation Rules Form A

Name Key
Date Period

Find the derivative. Simplify completely.

1. $f(x) = x^3 - 5x^2 + 2$
$f'(x) = 3x^2 - 10x$

2. $g(x) = 4\sin x - 3x^3$
$g'(x) = 4\cos x - 9x^2$

3. $y = \frac{4x-5}{\sqrt{x}} \Rightarrow 4x^{1/2} - 5x^{-1/2}$
$y' = 2x^{-1/2} + \frac{5}{2}x^{-3/2}$
$y' = \frac{4x+5}{2x^{3/2}}$

4. $f(x) = x^2 \sin x$
$f'(x) = x^2\cos x + \sin x(2x)$
$f'(x) = x(x\cos x + 2\sin x)$

Differentiation Rules Form B

Name
Date Period

Find the derivative. Simplify completely.

1. $f(x) = 2x^3 + 3x^2 - 4$
$f'(x) = 6x^2 + 6x$

2. $g(x) = x^3 - 5\cos x$
$g'(x) = 3x^2 + 5\sin x$

3. $y = \frac{3x-7}{\sqrt{x}} \Rightarrow 3x^{1/2} - 7x^{-1/2}$
$y' = \frac{3}{2}x^{-1/2} + \frac{7}{2}x^{-3/2}$
$y' = \frac{3x+7}{2x^{3/2}}$

4. $f(x) = 3x^2\cos x$
$f'(x) = 3x^2(-\sin x) + \cos x(6x)$
$f'(x) = 3x(2\cos x - x\sin x)$

Oct 13-2:32 PM

How did you do?

Differentiation Rules Form C

Name Key
Date Period

Find the derivative. Simplify completely.

1. $f(x) = 4x^3 + x^2 - 3x$
$f'(x) = 12x^2 + 2x - 3$

2. $g(x) = 5\tan x - 2x^3$
$g'(x) = 5\sec^2 x - 6x^2$

3. $y = \frac{5x+3}{\sqrt{x}} \Rightarrow 5x^{1/2} - 3x^{-1/2}$
$y' = \frac{5}{2}x^{-1/2} + \frac{3}{2}x^{-3/2}$
$y' = \frac{5x+3}{2x^{3/2}}$

4. $f(x) = x^3\cos x$
$f'(x) = x^3(-\sin x) + \cos x(3x^2)$
$f'(x) = x^2(3\cos x - x\sin x)$

Differentiation Rules Form D

Name Key
Date Period

Find the derivative. Simplify completely.

1. $f(x) = 2x^3 + 2x^2 - 5x$
$f'(x) = 6x^2 + 4x - 5$

2. $g(x) = 4x^3 - 3\cos x$
$g'(x) = 12x^2 + 3\sec^2 x$

3. $y = \frac{8x-5}{\sqrt{x}} \Rightarrow 8x^{1/2} - 5x^{-1/2}$
$y' = 4x^{-1/2} + \frac{5}{2}x^{-3/2}$
$y' = \frac{8x+5}{2x^{3/2}}$

4. $f(x) = x^4\sin x$
$f'(x) = x^4\cos x + \sin x(4x^3)$
$f'(x) = x^3(x\cos x + 4\sin x)$

Oct 13-2:35 PM

Find the derivative with respect to x.

$$f(x) = \frac{2x+1}{x-5}$$ high / low

0:03:00

$$f'(x) = \frac{(x-5)(2) - (2x+1)(1)}{(x-5)^2}$$ low deriv high − high d low / low low

$$f'(x) = \frac{2x-10-2x-1}{(x-5)^2} \rightarrow \frac{-11}{(x-5)^2}$$

Oct 13-2:35 PM

Developing the Quotient Rule

1) Start with the following quotient: $h(x) = \frac{f(x)}{g(x)}$

2) Isolate $f(x)$ $f(x) = h(x)g(x)$

3) Take the derivative of $f(x)$ $f'(x) = h(x)g'(x) + g(x)h'(x)$

4) Replace $h(x)$ with the quotient we started with $f'(x) = \frac{f(x)}{g(x)}g'(x) + g(x)h'(x)$

5) Isolate $h'(x)$ and express the other side as a single fraction in simplest form

$$\frac{g(x)}{g(x)}f'(x) - \frac{f(x)}{g(x)}g'(x) = g(x)h'(x)$$

$$\frac{1}{g(x)}\left(\frac{g(x)f'(x) - f(x)g'(x)}{g(x)}\right) = g(x)h'(x)\cdot\frac{1}{g(x)}$$

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

low deriv high − high deriv low / low low

Oct 17-9:50 AM

The Quotient Rule

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

$$\frac{\text{Low di} - \text{Hi} - \text{Hi di} - \text{Low}}{\text{Low Low}}$$

Oct 13-2:37 PM

$y = \frac{2x-3}{x+2}$

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

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

$y' = \frac{7}{(x+2)^2}$

Oct 17-9:55 AM

Differentiate and simplify

$g(x) = \frac{2x^3+4x^2-7}{x-5}$

$g'(x) = \frac{(x-5)(6x^2+8x) - (2x^3+4x^2-7)(1)}{(x-5)^2}$

Oct 13-2:40 PM

$y = \tan x$

$y = \frac{\sin x}{\cos x}$

$y' = \frac{\cos x \cos x - \sin x(-\sin x)}{\cos^2 x}$

$y' = \frac{\cos^2 x + \sin^2 x}{\cos^2 x}$

$y' = \frac{1}{\cos^2 x} \rightarrow \sec^2 x$

Oct 17-9:59 AM

Find an equation of the tangent line to the graph of f at the point $(-5, 5)$.

$f(x) = \frac{x}{x+4}$

$y - y_1 = m(x - x_1)$

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

$= \frac{(-5+4)(1) - (-5)}{(-5+4)^2}$

$= \frac{-1+5}{1} \rightarrow 4$

$y - 5 = 4(x+5)$

Oct 13-2:40 PM

Now go back to your daily quiz and try #5

Oct 13-2:41 PM

More Practice

Find the derivative of the following:

$y = \frac{2x+5}{3x-2}$

$y = \frac{x^2+5x-1}{x^2}$

Oct 17-10:01 AM