3.2 Product and Quotient Rule

CALCULUS

Write your questions here!

Find the derivative.

$$f(x) = (x + 4)(2x - 5)$$

PRODUCT RULE

$$\frac{d}{dx}(uv) =$$

Find the derivative of the following.

$$f(x) = (3x^2 + 2x - 3)(x - 1)$$

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

Evaluate

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

Find $f'(4)$

Find the derivative.

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

QUOTIENT RULE

$$\frac{d}{dx}(uv) =$$

Find the derivative of the following.

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

$$y = \frac{2x^2}{3x + 1}$$

Horizontal Tangents

Find all horizontal tangents for $y = \frac{2x^2}{3x+1}$

Find $f'(4)$ given the following:

$$g(4) = 3 \text{ and } g'(4) = -2$$

$$h(4) = -1 \text{ and } h'(4) = 5$$

$f(x) = g(x) - h(x)$ $\quad$ $f(x) = h(x) + 2$ $\quad$ $f(x) = g(x) + 2h(x)$

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

SUMMARY:

Now, summarize your notes here!

PRACTICE

Find the derivative of the following.

1. $f(x) = \frac{5x-2}{x^2+1}$

2. $g(x) = (2x+1)(x^3-1)$

3. $y = (3x^2-2x)(x^2+3x-4)$

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

5. $f(t) = \frac{t+1}{\sqrt{t}}$

6. $f(r) = r^2(5r^3+3)$

Find the derivatives of the following.

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

$\frac{dy}{dx} =$

$\frac{d^2y}{dx^2} =$

8. $y = x^{-2}(ex^3+3)$

$y' =$

$y'' =$

Given $f(x) = (x^2 - 5)(3x + 2)$, find the following.

9. $f'(2) =$

10. Find the slope of $f(x)$ at $x = -3$.

11. What is the slope of the tangent line of $f(x)$ at the point (4, 48) ?

Is the slope of the tangent line positive, negative, or zero at the given point?

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

13. $g(x) = (x+1)^2$ at $x = -4$

Determine the x-values (if any) at which the function has a horizontal tangent line.

14. $f(x) = \frac{4x^3 - 10x^2}{2x}$

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

Write the equation of the tangent line and the normal line at the point given.

16. $f(x) = \frac{x-1}{x+1}$ at $x = 2$

Find $f'(2)$ given the following.

$g(2) = 3$ **and** $g'(2) = -2$

$h(2) = -1$ **and** $h'(2) = 4$

17. $f(x) = 2g(x) + h(x)$

18. $f(x) = 4 - h(x)$

19. $f(x) = \frac{g(x)}{h(x)}$

20. $f(x) = g(x)h(x)$

MULTIPLE CHOICE

1. Suppose $f(x)$ is a differentiable function with $f(1) = 2, f(2) = -2, f'(2) = 5, f'(1) = 3,$ and $f(5) = 1.$ An equation of a line tangent to the graph of *f* is

    (A) $y - 3 = 2(x - 1)$
    (B) $y - 2 = (x - 1)$
    (C) $y - 3 = 5(x - 1)$
    (D) $y - 2 = 3(x - 1)$
    (E) $y - 1 = 5(x - 2)$

2. Let *f* and *g* be differentiable functions with the following properties:

    I. $f(x) < 0$ for all x
    II. $g(5) = 2$

    If $h(x) = \frac{f(x)}{g(x)}$ and $h'(x) = \frac{f'(x)}{g(x)}$, then $g(x) =$

    (A) $\frac{1}{f'(x)}$
    (B) $f(x)$
    (C) $-f(x)$
    (D) 0
    (E) 2

3. At what point on the graph of $y = \frac{1}{2}x^2 - \frac{3}{2}$ is the tangent line parallel to the line $4x - 8y = 5$?

    (A) $\left(\frac{1}{2}, -\frac{3}{8}\right)$
    (B) $\left(\frac{1}{2}, -\frac{11}{8}\right)$
    (C) $\left(2, \frac{3}{8}\right)$
    (D) $\left(2, \frac{1}{2}\right)$
    (E) $\left(-\frac{1}{2}, -\frac{11}{8}\right)$

4. If $f(x)$ is continuous and differentiable and $f(x) = \begin{cases} ax^4 + 5x; & x \leq 2 \\ bx^2 - 3x; & x > 2 \end{cases}$, then find the value of *b*.

    (A) 0.5
    (B) 0
    (C) 2
    (D) 6
    (E) There is no value of *b*.

You are allowed to use a graphing calculator for #5

5. Which of the following functions are continuous but not differentiable at $x = 0$?

I. $f(x) = x^{\frac{1}{3}}$

II. $g(x) = |x|$

III. $h(x) = x|x|$

(A) I only

(B) II only

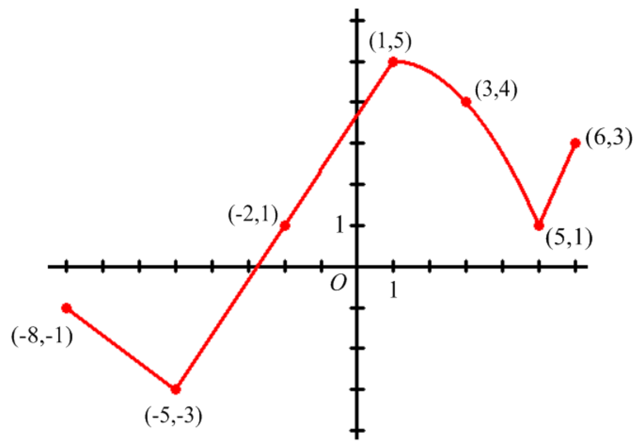
(C) I and II

(D) II and III

(E) I, II, and III

<u>FREE RESPONSE</u>

Your score: ____ out of 4



Graph of g

1. A continuous function g is defined on the closed interval $-8 \le x \le 6$ and is shown above.

(a) Find the approximate value of $g'(4)$. Show the computations that lead to your answer.

(b) Let h be the function defined by $h(x) = \frac{g(x)}{x^2+1}$. Find $h'(-2)$.