Calculus Name_____ ID: 1

Assignment

Date_____ Period____

For each problem, find the average rate of change of the function over the given interval.

1) $y = x^2 + 2x + 1; \quad [-1, 0]$

Use the definition of the derivative to find the derivative of each function with respect to *x*.

2) $y = -2x^2 + 2$

Differentiate each function with respect to *x*.

3) $f(x) = 2\sqrt[5]{x} + 4x^{-3}$

For each problem, find the indicated derivative with respect to *x*.

4) $y = 3x^5 + 5x^4$ Find $\frac{d^2y}{dx^2}$

Differentiate each function with respect to *x*.

5) $y = \left(-2x^2 + 5\right) \cdot -x^2$

6) $y = \frac{5x^3 + 5}{2x^4 + 2}$

7) $y = \left(4x^5 - 1\right)^4$

8) $y = \sqrt[3]{\csc 4x^5}$

9) $y = \left(\left(-3x^3 + 5\right)^2 + 4\right)^3$

10) $y = \sqrt[5]{-x^5 + 5}\left(4x^3 + 1\right)$

11) $y = \csc\left(\cos 5x^4\right)$

12) $f\left(x\right) = \left(4x^2 + 5\right)\csc 4x^4$

13) $y = \tan x^4 \csc 3x^5$

14) $y = \sin x^5 \cdot (x^2 + 2)$

For each problem, you are given a table containing some values of differentiable functions $f(x)$, $g(x)$ and their derivatives. Use the table data and the rules of differentiation to solve each problem.

15)

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	3	−1	2	1
2	2	−1	3	1
3	1	0	4	$-\frac{1}{2}$
4	2	1	2	−2

Part 1) Given $h_1(x) = f(x) + g(x)$, find $h_1'(1)$

Part 2) Given $h_2(x) = f(x) - g(x)$, find $h_2'(4)$

Part 3) Given $h_3(x) = f(x) \cdot g(x)$, find $h_3'(4)$

Part 4) Given $h_4(x) = \frac{f(x)}{g(x)}$, find $h_4'(2)$

Part 5) Given $h_5(x) = (f(x))^2$, find $h_5'(1)$

Part 6) Given $h_6(x) = f(g(x))$, find $h_6'(3)$

Answers to Assignment (ID: 1)

1) 1

2) $\frac{dy}{dx} = -4x$

3) $f'(x) = \frac{2}{5}x^{-\frac{4}{5}} - 12x^{-4}$

4) $\frac{d^2y}{dx^2} = 60x^3 + 60x^2$

5) $\frac{dy}{dx} = (-2x^2 + 5) \cdot -2x - x^2 \cdot -4x$
$= 8x^3 - 10x$

6) $\frac{dy}{dx} = \frac{(2x^4 + 2) \cdot 15x^2 - (5x^3 + 5) \cdot 8x^3}{(2x^4 + 2)^2}$
$= \frac{-5x^6 - 20x^3 + 15x^2}{2x^8 + 4x^4 + 2}$

7) $\frac{dy}{dx} = 4(4x^5 - 1)^3 \cdot 20x^4$
$= 80x^4(4x^5 - 1)^3$

8) $\frac{dy}{dx} = \frac{1}{3} \cdot (\csc 4x^5)^{-\frac{2}{3}} \cdot -\csc 4x^5 \cot 4x^5 \cdot 20x^4$
$= -\frac{20x^4(\csc 4x^5)^{\frac{1}{3}} \cdot \cot 4x^5}{3}$

9) $\frac{dy}{dx} = 3\left((-3x^3 + 5)^2 + 4\right)^2 \cdot 2(-3x^3 + 5) \cdot -9x^2$
$= -54x^2\left((-3x^3 + 5)^2 + 4\right)^2(-3x^3 + 5)$

10) $\frac{dy}{dx} = (-x^5 + 5)^{\frac{1}{5}} \cdot 12x^2 + (4x^3 + 1) \cdot \frac{1}{5}(-x^5 + 5)^{-\frac{4}{5}} \cdot -5x^4$

11) $\frac{dy}{dx} = -\csc(\cos 5x^4)\cot(\cos 5x^4) \cdot -\sin 5x^4 \cdot 20x^3$
$= 20x^3 \csc(\cos 5x^4)\cot(\cos 5x^4)\sin 5x^4$

12) $f'(x) = (4x^2 + 5) \cdot -\csc 4x^4 \cot 4x^4 \cdot 16x^3 + \csc 4x^4 \cdot 8x$
$= 8x\csc 4x^4 \cdot (-8x^4 \cot 4x^4 - 10x^2 \cot 4x^4 + 1)$

13) $\frac{dy}{dx} = \tan x^4 \cdot -\csc 3x^5 \cot 3x^5 \cdot 15x^4 + \csc 3x^5 \cdot \sec^2 x^4 \cdot 4x^3$
$= x^3 \csc 3x^5 \cdot (-15x \tan x^4 \cot 3x^5 + 4\sec^2 x^4)$

14) $\frac{dy}{dx} = \sin x^5 \cdot 2x + (x^2 + 2) \cdot \cos x^5 \cdot 5x^4$
$= x(2\sin x^5 + 5x^5 \cos x^5 + 10x^3 \cos x^5)$

15) $h_1'(1) = f'(1) + g'(1) = 0$
$h_2'(4) = f'(4) - g'(4) = 3$
$h_3'(4) = f(4) \cdot g'(4) + g(4) \cdot f'(4) = -2$
$h_4'(2) = \frac{g(2) \cdot f'(2) - f(2) \cdot g'(2)}{(g(2))^2} = -\frac{5}{9}$
$h_5'(1) = 2 \cdot f(1) \cdot f'(1) = -6$
$h_6'(3) = f'(g(3)) \cdot g'(3) = -\frac{1}{2}$