Derivatives Review 1

Key

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.

1)

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

$\frac{3}{2}$ Part 1) Given $h_1(x) = f(x) + g(x)$, find $h_1'(3)$

-3 Part 2) Given $h_2(x) = f(x) - g(x)$, find $h_2'(1)$

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

$-\frac{7}{4}$ Part 4) Given $h_4(x) = \frac{f(x)}{g(x)}$, find $h_4'(1)$

-12 Part 5) Given $h_5(x) = (f(x))^2$, find $h_5'(1)$

$\frac{3}{2}$ Part 6) Given $h_6(x) = f(g(x))$, find $h_6'(2)$

2)

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

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

-4 Part 2) Given $h_2(x) = f(x) - g(x)$, find $h_2'(1)$

$-\frac{3}{2}$ Part 3) Given $h_3(x) = f(x) \cdot g(x)$, find $h_3'(2)$

$-\frac{5}{6}$ Part 4) Given $h_4(x) = \frac{f(x)}{g(x)}$, find $h_4'(2)$

-16 Part 5) Given $h_5(x) = (f(x))^2$, find $h_5'(1)$

$-\frac{1}{2}$ Part 6) Given $h_6(x) = f(g(x))$, find $h_6'(4)$

3)

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

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

-1 Part 2) Given $h_2(x) = f(x) - g(x)$, find $h_2'(1)$

4 Part 3) Given $h_3(x) = f(x) \cdot g(x)$, find $h_3'(1)$

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

8 Part 5) Given $h_5(x) = (f(x))^2$, find $h_5'(4)$

0 Part 6) Given $h_6(x) = f(g(x))$, find $h_6'(2)$

4)

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

2 Part 1) Given $h_1(x) = f(x) + g(x)$, find $h_1'(4)$

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

-11 Part 3) Given $h_3(x) = f(x) \cdot g(x)$, find $h_3'(1)$

3 Part 4) Given $h_4(x) = \frac{f(x)}{g(x)}$, find $h_4'(3)$

-12 Part 5) Given $h_5(x) = (f(x))^2$, find $h_5'(1)$

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

Differentiate each function with respect to the given variable.

5) $g(t) = (4t^4 + 5)^{\frac{1}{2}}(-4t^2 + 3)$

$(4t^4+5)^{\frac{1}{2}}(-8t) + (-4t^2+3)\frac{1}{2}(4t^4+5)^{-\frac{1}{2}}(16t^3)$

6) $g(s) = \dfrac{(-5s^4 - 1)^2}{(2s^5 - 1)^{-5}}$

$\dfrac{(2s^5-1)^{-5}2(-5s^4-1)(-20s^3) - (-5s^4-1)^2(-5)(2s^5-1)^{-6}(10s^4)}{(2s^5-1)^{-10}}$

7) $y = \sec 3x^3$

$\sec(3x^3)\tan(3x^3)\cdot 9x^2$

8) $f(x) = (5x^5 - 4)\cos 5x^2$

$(5x^5-4)(-\sin(5x^2)(10x)) + \cos(5x^2)(25x^4)$

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

$\dfrac{\csc 3x^4(-8x) - (-4x^2-1)(-\csc(3x^4)\cot(3x^4)(12x^3))}{(\csc(3x^4))^2}$

10) $f(x) = \sin 4x^5$

$\cos(4x^5)(20x^4)$

11) $y = 3x^2 + \dfrac{3}{x} + \dfrac{1}{x^5}$ Find $\dfrac{d^2y}{dx^2}$

$\dfrac{dy}{dx} = 6x - \dfrac{3}{x^2} - \dfrac{5}{x^6}$

$\dfrac{d^2y}{dx^2} = 6 + \dfrac{6}{x^3} + \dfrac{30}{x^7}$

Find the equation of the line tangent to the function at the given point.

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

$f'(x) = \dfrac{1\cdot 3}{2\sqrt{3x+3}}$ $f'(2) = \dfrac{1}{2}$ $y - 3 = \dfrac{1}{2}(x-2)$

A particle moves along a horizontal line. Its position function is $s(t)$ for $t \geq 0$. For each problem, find the times t when the particle changes directions, the intervals of time when the particle is moving left and moving right, the times t when the acceleration is 0, and the intervals of time when the particle is slowing down and speeding up.

13) $s(t) = -t^3 + 24t^2 - 144t$

$v(t) = -3t^2 + 48t - 144$

$a(t) = -6t + 48$

Change dir

$0 = -3t^2 + 48t - 144$

$0 = -(t^2 - 16t + 48)$

$0 = -(t-4)(t-12)$

$-$ 4 $+$ 12 $-$

$t = 4$ $t = 12$

(t = 4 and t = 12)

moving right

$(4, 12)$

moving left

$(0,4) \cup (12, \infty)$

acceleration is 0

$0 = -6t + 48$

$-48 = -6t$

$\boxed{t = 8}$

$+$ 8 $-$ $a(t)$

$+$ 4 $-$ 12 $+$ $v(t)$

Slowing down

$(0,4) \cup (8, 12)$

Speeding up

$(4, 8) \cup (12, \infty)$