MCV4U Derivatives Quiz Friday, March 1, 2024

Version 2

1. Determine each of the following derivatives. You do not need to simplify. You can leave your answer the way it appears after your first line. /7 marks total

a. $f(x) = 3(2x^3 - 19x^2 + 1)^6(5x-4)^8$

$f'(x) = (18)(2x^3-19x^2+1)^5(6x^2-38x)(5x-4)^8 + (3)(2x^3-19x^2+1)^6(8)(5x-4)^7(5)$

✓ 4/4

b. $g(x) = \frac{3x+4}{(8x^2-7x+2)^5}$

$g'(x) = \dfrac{(8x^2-7x+2)^5(3) - (3x+4)(5)(8x^2-7x+2)^4(16x-7)}{(8x^2-7x+2)^{10}}$

✓ 3/3

2. The curve $y = x^3 + ax^2 + bx + 14$ has a horizontal tangent at (4, 30). Solve for a and b. /4 marks

$y = x^3 + ax^2 + bx + 14$

$y' = 3x^2 + 2ax + b$

$0 = 3x^2 + 2ax + b$

$0 = 3(4)^2 + 2a(4) + b$

$0 = 48 + 8a + b$

$b = -8a - 48$

horizontal tangent means $y' = 0$

$30 = (4)^3 + a(4)^2 + b(4) + 14$

$30 = 64 + 16a + 4b + 14$

$-48 = 16a + 4b$

PLUG IN $b = -8a - 48$

$-48 = 16a + 4(-8a - 48)$

$-48 = 16a - 32a - 192$

$144 = -16a$

$\boxed{a = -9}$

$b = -8(-9) - 48$

$= (72) - (48)$

$= 24$

✓ 4

$a = -9$ $b = 24$

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3. The position from its starting point, s, of an object at t seconds is given by $s(t) = \frac{8t}{2t^2+18}$, $t \geq 0$. When does the object change direction? /4 marks

change in direction means $s'(t)=0$

$s(t) = \frac{8t}{2t^2+18}$

$s'(t) = \frac{(2t^2+18)(8) - (8t)(4t)}{(2t^2+18)^2}$

$0 = 16t^2 + 144 - 32t^2$

$0 = -16t^2 + 144$

$16t^2 = 144$

$\sqrt{t^2} = \sqrt{9}$

$t = 3$ seconds

✓ 4

The object changes direction at a time of 3 seconds.

4. We are given the following table, and we know that $h(x) = f(g(x))$. Evaluate $h'(3)$. /3 marks

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
-1	2	12	0	6
1	3	5	-1	-6
3	-4	8	-2	-8
3	9	-8	-4	11
5	-6	1	-7	13

$h'(3) =$