Task 1: Give it a go quizzes

SIT190 - Week 8 - Quiz - Short

Click on a question number to see how your answers were marked and, where available, full solutions.

Question Number	Score	
Question 1	3 / 3	Review
Question 2	3 / 3	Review
Question 3	3 / 3	Review
Question 4	4 / 4	Review
Question 5	2 / 2	Review
Total	**15 / 15 (100%)**	

Performance Summary

Exam Name:	SIT190 - Week 8 - Quiz - Short
Session ID:	13937764290
Student's Name:	COWLISHAW, Ethan Del (edcowlishaw)
Exam Start:	Sat May 04 2024 13:21:29
Exam Stop:	Sat May 04 2024 14:03:49
Time Spent:	0:42:19

SIT190 - Week 8 - Quiz - Short

Click on a question number to see how your answers were marked and, where available, full solutions.

Question Number	Score	
Question 1	3 / 3	Review
Question 2	3 / 3	Review
Question 3	3 / 3	Review
Question 4	4 / 4	Review
Question 5	2 / 2	Review
Total	**15 / 15 (100%)**	

Performance Summary

Exam Name:	SIT190 - Week 8 - Quiz - Short
Session ID:	15037132500
Student's Name:	COWLISHAW, Ethan Del (edcowlishaw)
Exam Start:	Sat May 04 2024 14:18:32
Exam Stop:	Sat May 04 2024 14:28:45
Time Spent:	0:10:12

I struggled immensely with the final problem. I do not know if I calculated that how it should have been calculated. I found that the equation I used to figure out the speed $(9t+7)$ must have been the first derivative (as y' = velocity), further evidenced by the acceleration being a constant $9\ \mathrm{m/s^2}$, the second derivative.
I figured there could not have been another constant as the question did not state any, so I backtracked y' using the power rule but in reverse.
$9t \to \frac{9}{n}t^{1+1} = \frac{9}{2}t^2$ and $7 = 7t^0 = 7t^{0+1} = 7t$ to get $9t^2 + 7t$ as the primary y equation.

I am going to aim to understand what I did, which I understand to be what integrals are. The week 10 class will cover this so I will prepare for then.

I improved significantly between attempts, mainly because I roughly knew how to execute the last question properly. Again, I found the anti-derivative which unearthed the answer. I am studying integrals in preparation now and I realise they are similar to what I have been attempting. I am extremely happy that I thought of doing the y' to y without knowing about how to use integrals first as it feels like I discovered a piece of calculus myself through my practice in this trimester.

Task 2: The Derivative

1) For each of the following functions, identify which rule (the product rule, quotient rule or chain rule) you would use to differentiate the function and why.

a) $y = \cos(x^{\frac{2}{5}} + 2)$

I would use chain rule as there is a nested function, $\cos$ and within it, $x^{\frac{2}{5}}$.

b) $g(x) = \frac{\ln(x^3)}{x}$

I would use the quotient rule as it involves dividing functions. I may also employ the chain rule for the natural log

$f(x) = e^{3x} \times \sin(\frac{x}{15})$

I would use the product rule as the functions are being multiplied.

2) Use the product rule to differentiate

$y = e^{2x}(3x^5 - x^2)$

$u = e^{2x}$
$u' = 2e^{2x}$

$v = 3x^5 - x^2$
$v' = 15x^4 - 2x$

$u \times v' + v \times u'$
-> $e^{2x} \times (15x^4 - 2x) + (3x^5 - x^2) \times 2e^{2x}$
-> $15x^4e^{2x} \times -2e^{2x}x + 6x^5e^{2x} \times -2x^2e^{2x}$
$= -30x^5e^{4x} + -12x^7e^{4x}$

3) Use the quotient rule to differentiate

$y = \frac{\tan(3x)}{3x-9}, x \neq 3$

$u = \tan(3x)$
$u' = 3\sec(3x)^2$

$v = 3x - 9$
$v' = 3$

$f'(x) = \frac{vu' - uv'}{v^2}$

$\frac{(3x-9) \times 3\sec(3x)^2 - \tan(3x) \times 3}{(3x-9)^2}$
-> $\frac{3(3x-9) \times \sec(3x)^2 - 3\tan(3x)}{(3x-9)^2}$
-> $\frac{\sec(3x)^2(9x-27) - 3\tan(3x)}{(3x-9)^2}$
-> $\frac{3(\sec(3x)^2(9x-27) - \tan(3x))}{(3(x-3))^2}$
-> $\frac{\cancel{3}(\sec(3x)^2(9x-27) - \tan(3x))}{\cancel{9}(x-3)^2}$
$= \frac{\sec(3x)^2(9x-27) - \tan(3x)}{3(x-3)^2}$
or
$= \frac{3\sec(3x)^2(3x-9) - \tan(3x)}{3(x-3)^2}$

4) Use the chain rule to differentiate

$y = \ln(7x^3 - 5x^2), x > 0$

$u = 7x^3 - 5x^2$
$u' = 21x^2 - 10x$

$v = \ln(u)$
$v' = \frac{1}{u}$

$u' \times v'$
-> $(21x^2 - 10) \times \frac{1}{7x^3-5x^2}$
$= \frac{21x^2-10}{7x^3-5x^2}$

5) The displacement (in metres) of a particles at time t seconds is given by $s = 2000t^2 - 30t^4$ for $0 \leq t \leq 90$

a) Find the velocity and acceleration of the particle at time t

$2000t^2 - 30t^4$
-> $2 \times 2000t^{2-1} - 4 \times 30t^{4-1}$
-> $s' = 4000t^1 - 120t^3$

Velocity: $v = 4000t - 120t^3$

$s' = 4000t - 120t^3$
-> $4000t^{1-1} - 3(120)t^{3-1}$
-> $s'' = 4000 - 360t^2$

Acceleration: $a = 4000 - 360t^2$

b) What is the displacement, velocity and acceleration at time $t = 1$ second?

$s = 2000t^2 - 30t^4$
-> $2000(1)^2 - 30(1)^4$
->$2000 - 30$
$s = 1970\text{m}$ at $t = 1$s

$v = 4000t - 120t^3$
-> $v = 4000(1) - 120(1)^3$
$v = 3880 \text{ m/s}^2$ at $t = 1$s

$a = 4000 - 360t^2$
-> $4000 - 360(1)^2$
$a = 3640 \text{ m/s}^2$ at $t = 1$s