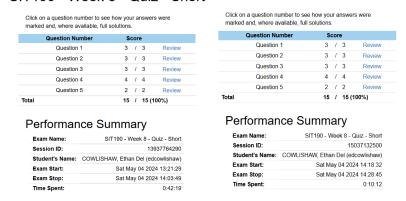
Task 1: Give it a go quizzes

SIT190 - Week 8 - Quiz - Short SIT190 - Week 8 - Quiz - Short



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 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.

$$9t o rac{9}{n}t^{1+1}=rac{9}{2}t^2$$
 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

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

$$u = \tan(3x)$$

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

$$v = 3x - 9$$

$$v' = 3$$

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

$$\frac{(3x-9)\times 3\sec(3x)^2 - \tan(3x)\times 3}{(3x-9)^2}$$

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

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

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

$$\Rightarrow \frac{\cancel{3}(\sec(3x)^2(9x-27) - \tan(3x)}{\cancel{3}(x-3)^2}$$

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

4) Use the chain rule to differentiate

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

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

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?

$$s = 2000t^2 - 30t^4$$

 $> 2000(1)^2 - 30(1)^4$
 $> 2000 - 30$
 $s = 1970 \text{m at } t = 1 \text{s}$
 $v = 4000t - 120t^3$
 $> v = 4000(1) - 120(1)^3$
 $v = 3880 \text{ m/s}^2 \text{ at } t = 1 \text{s}$
 $a = 4000 - 360t^2$
 $> 4000 - 360(1)^2$
 $a = 3640 \text{ m/s}^2 \text{ at } t = 1 \text{s}$