VICTORIA UNIVERSITY BANGLADESH

Assignment On

Course Name : Differential Calculus & Coordinate Geometry

Course code : MAT-115

Submitted By	Submitted To
Name: Md. Arif Hossain Reg: 2219150041 Batch: 15th Program: B.sc in CSE	Umme Khadiza Tithi Department of CSE/CSIT Lecturer Victoria University Of Bangladesh

Name: MD. Arif Hossain

ID: 2210150041

Answer to the question NO 1.

(i) $y = e^{3x+2}$

$y' = \frac{d}{dx} e^{3x+2}$

$= e^{3x+2} \frac{d}{dx}(3x+1)$

$= 3e^{3x+2}$

$y^2 = \frac{d}{dx}\{3e^{3x+2}\}$

$= 3e^{3x+2} \frac{d}{dx}(3x+2)$

$= 9e^{3x+2}$

(ii) $y = \log x + a^x$

$y' = \frac{1}{x} + a^x \log a = x^{-1} + a^x \log a$

$y^2 = -x^{-2} + a^x . 0 + \log a \cdot \frac{d}{dx}(a^x)$

$= -\frac{1}{x^2} + \log a . a^x \log a$

$= -\frac{1}{x^2} + a^x (\log a)^2$

Answer to the question NO: 2

$f(x) = 3x^2 - 2x + 4$

$f'(x) = 6x - 2$

at $x = 0$ $f(x) = 4$ and $f'(x) = -2$

taugent line, $y - y_1 = m(x - x_1)$

$\Rightarrow y - 4 = 2(x - 0)$

$\Rightarrow 2x + y = 4$

at $x = 3$; $f(x) = 25$, $f'(x) = 16$

tangent line $y - y' = m(x - x_1)$

$\Rightarrow y - 25 = 16(x - 3)$

$\Rightarrow y - 25 = 16x - 48$

$\Rightarrow 16x - y = 23$

Answer to the question NO: 4

$y = x^2 - 2x + 3$

$y' = 2x - 2$

for stationary point

$y' = 0$

$\Rightarrow 2x - 2 = 0$

$\Rightarrow x = 1$

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Answer to the question NO: 5

$$W = \cos(x^2 + 2y)\, e^{4x - z^4 y} + y^3$$

$$\frac{\partial w}{\partial x} = -\sin(x^2 + 2y) \cdot 2x - e^{4x - z^4} \cdot 4 + 0$$

$$= -2x \sin(x^2 + 2y) - 4e^{4x - z^2 y}$$

$$\frac{\partial w}{\partial y} = -\sin(x^2 + 2y) \cdot 2 - e^{4x - z^4 y} \cdot z^4 + 3y$$

$$= -2\sin(x^2 + 2y) - z^4 e^{4x - z^4 y} + 3y$$

$$\frac{\partial w}{\partial z} = 0 - e^{4x - z^4 y}(-4z^3 y) + 0$$

$$= 4z^3 y e^{4x - z^4 y}$$

Answer to the question NO: 3

Relative minimun.

Consider the function $y = x^2 - 2x + 3$ By differentiating and setting the derivative to zero - $\frac{dy}{dx} = 2x - 2 = 0$ When $x = 1$ we know there is a stationary point at $x = 1$.

Again, we use the first that this is the only stationary point to divide the real line into two intervals; $x < 1$ and $x > 1$

From the derivative we know that since

$$\frac{dy}{dx} = 2x - 2 = 2(x-1) < 0 \text{ when } x < 1$$

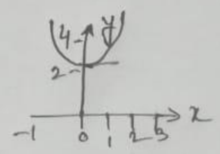
the function is decreasing for $x < 1$ (Choose a point wich is < 1, saw $x = 0$, asa test point.)

similarly since $\frac{dy}{dx} = 2(x-1) > 0$ when $x > 1$

The function is increasing for $x > 1$. (We could sue the point $x = 2$) asa test point here)

of course, at the point $x = 1$ it self $\frac{dy}{dx} = 0$

Therefore, We deduce that the stationary point at $x = 1$ is a relative minimum.



The graph of $y = x^2 - 2x + 3$

Since, $\frac{dy}{dx} < 0$ for $x < 1$

$\frac{dy}{dx} = 0$ for $x = 1$

and $\frac{dy}{dx} > 0$ for $x > 1$

we have a relative minimum at $x = 1$.

Again we can summarise this in atable

x	<1	1	>1
y'	- ve	0	+ve
y	↘	1	↗