Course Code: BIT 116 **Course Name: Mathematics I**

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COLLEGE OF MANAGEMENT & INFORMATION TECHNOLOGY

BACHELOR IN INFORMATION TECHNOLOGY

ASSIGNMENT

Submitted by:

Name: Bishal Bhattarai
Year/ Semester: First, Fall 2019
LCID: LC00017000753

Submitted to:

Lincoln University

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1. Find the Domain and Range of $f(x) = \sqrt{2-x-x^2}$

Solution: Here,
$2-x-x^2=0$
Or, $(2+x)(1-x) = 0$

Either, $x = 1$ or, -2
The interval be $(-\infty,-2)\cup(-2,1)\cup(1,\infty)$

Now, the sign conversion,

	2+x	1-x	(2+x)(1-x)
$(-\infty,-2)$	-	+	-
$(-2,1)$	+	+	+
$(1,\infty)$	+	-	-

Here, only the positive sign is taken. So, the Domain is found to be (-2,1).

For range,

$$y = \sqrt{2-x-x^2}$$
$$= \sqrt{(2+x)(1-x)}$$

For, minimum value we take x=0, then the output will be maximum value. So the Range is $(0,\sqrt{2})$.

2. Find the solution of: $\frac{dx}{x^2+1} + \frac{dy}{y+1} = 0$

- Solution:
  Here,

  Integrating both side;

$$\int \frac{dx}{x^2+1} + \int \frac{dy}{y+1} = 0$$

Or, $\tan^{-1}x + \log(y+1) = 0$

Differentiate: $y = 4sect + tant$

- Solution: Given, y= 4sect +tant

Differentiate with respect to t we get,

Or, $\frac{dy}{dt} = \frac{d(4sect+tant)}{dt}$

$\therefore \frac{dy}{dt} = 4sect.tant + sec^2t$

2. If $f''(x)=20x^3-12x^2+6x$, then find f(x).

- Solution: Given, $f'(x) = 20x^3-12x^2+6x$

Integrating both sides we get,

Or, $\int f''(x) = \int 20x^3 - 12x^2 + 6x$

Or, $f'(x) = \int 20x^3 - 12x^2 + 6x$

Or, $f'(x) = \frac{20x^4}{4} - \frac{12x^3}{3} + \frac{6x^2}{2}$

Or, $f'(x) = 5x^4-4x^3+3x^2$

Integrating both sides we get,

Or, $\int f'(x) = \int 5x^4 - 4x^3 + 3x^2$

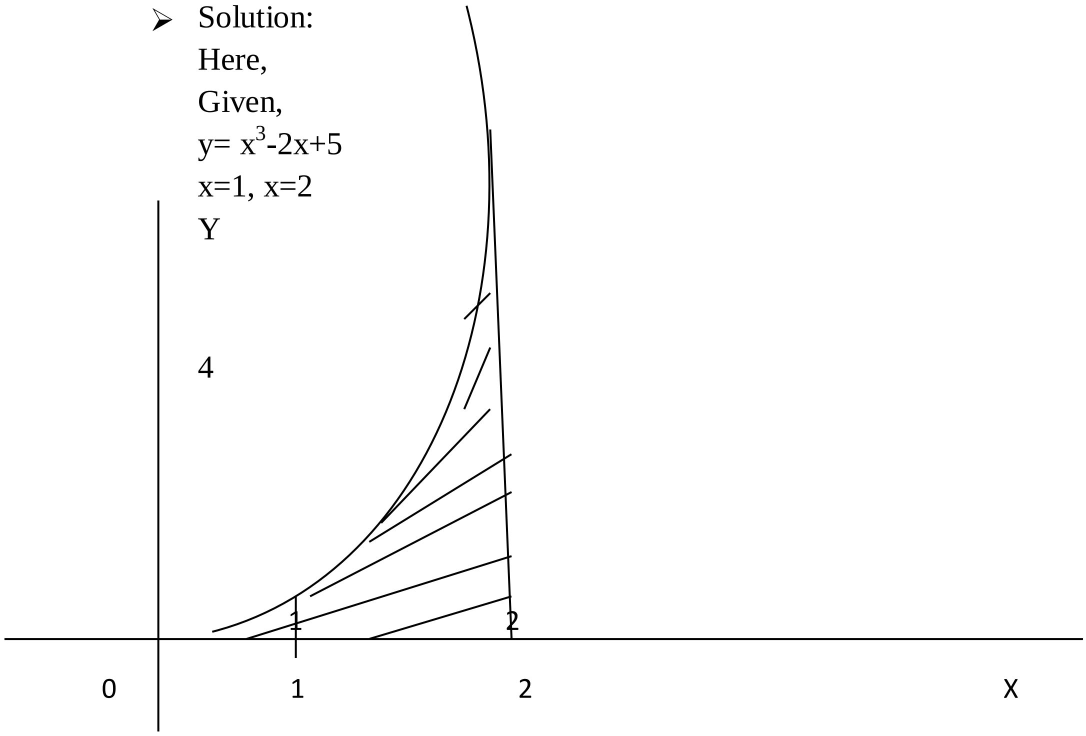
Or, $f(x) = \frac{5x^5}{5} - \frac{4x^4}{4} + \frac{3x^3}{3}$

Or, $f(x) = x^5-x^4+x^3$

Hence, f(x) is found to be $x^5-x^4+x^3$.

3. Find the area enclosed between x axis, the curve $y= x^3-2x+5$ and the ordinates x=1 and x=2.

- Solution:
  Here,
  Given,
  y= x^3-2x+5
  x=1, x=2



From the formula;

Area= $\int_a^b (upper\ function - lower function)dx$

Now a=1 and b=2 then the function becomes

A= $\int_1^2 x^3 - 2x + 5$

A= $[\frac{x^4}{4} - \frac{2x^2}{2} + 5x]_1{}^2$

A= [4-4+10]-[$\frac{1}{4} + 4$]

A= 10-$\frac{17}{4}$

$\therefore$ A= 5.75 sq.unit

Hence, the area enclosed between x-axis is found to be 5.75 sq unit.

4. Find $\int \frac{dx}{e^x + 1}$(Antiderivatives)

- Solution: Given,

  Or, $\int \frac{dx}{e^x+1}$

Or, $\int \frac{e^x+1-e^x}{e^x+1}dx$

Or, $\int \frac{e^x+1}{e^x+1}$dx -$\int \frac{e^x}{e^x+1}dx$

Or, $\int dx - \ln(e^x+1)$

Or, x- ln(e^x+1) +C

∴ Antiderivatives of the function $\int \frac{dx}{e^x+1}$ is found to be xln(e^x+1)+C.

State and Verify mean value theorem for f(x)= x^3-x in [0,2] ➢ Solution:

Here,

Given function is f(x) = x^3-x which is continuous on close interval [a,b]

Then, there exist some number in c in [a,b] such that f'(c)

f'(c) = $\frac{f(b)-f(a)}{b-a}$

[a,b]=[0,2]

Then, a=0 and b= 2.

Now, f(a)=x^3-x Or,
f(0)=0 f(b)= x^3-x f(2)=
6

Or, f'(c) = $\frac{f(b)-f(a)}{b-a}$

Or, f'(c) =$\frac{6-0}{2-0}$

∴ f'(c) =3

Again, f'(c)= $3x^2$

From above we found f'(c)= 3

Or, 3= $3x^2$

Or, x= 1

Therefore, 1 lies between the interval 0 and 2. Hence, it proves mean value theorem.