COLLEGE OF MANAGEMENT &

INFORMATION TECHNOLOGY

BACHELOR IN INFORMATION TECHNOLOGY

Submitted by: **Submitted to:**

ISHWOR KHATIWADA Lincoln University

College

Year/ Semester: 1st Semester/ 1st Year

LCID: LC00017000772 **Date: 04-07-2020**

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

SOLLUTION:

Or,2-x-x^2=0

or, x^2 + x - 2 =0

or, x^2 + 2x – x -2 = 0

or, x(x+2) - 1(x+2) =0

or, (x+2) (x-1) =0

Either, x = -2 or, x =1

Then, The interval will be (-∞,-2)U(-2,1)U(1,∞).

	(2+x)	(1-x)	(2+x)(1-x)
(-∞,-2)	-	+	-
(-2,1)	+	+	+
(1,∞)	+	-	-

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

For range, squaring both sides for the equation; we get,

Y= $\sqrt{2-x-x^2}$

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

or, y= $\sqrt{-[\{x^2+2.x.\frac{1}{2}+\left(\frac{1}{2}\right)^2-\left(\frac{1}{2}\right)^2\}-2]}$

or, y = $\sqrt{-[\{x+\frac{1}{2}\}^2-\frac{9}{4}]}$

or, y= $\sqrt{(\frac{3}{2})^2-(x+\frac{1}{2})^2}$

or, $y^2 = (\frac{3}{2})^2-(x+\frac{1}{2})^2$ (squaring on both sides)

or,$(x+\frac{1}{2})^2 = (\frac{3}{2})^2-y^2$

or,$(\frac{3}{2})^2 - y^2 \geq 0$ $\{\because (x+\frac{1}{2})^2 \geq 0\}$

or,$(\frac{3}{2})^2 \geq y^2$ Here, y is a positive root so, $Range\ of\ function\ R(f) = (0,\frac{3}{2})$

2. Find the solution of:

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

SOLLUTION

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

Integration on both sides, we get,$\int\frac{1}{x^2+1}dx=-\int\frac{dy}{y\ \ +1}$

$or,$ $\tan^{-1}x$ = - log(y+1) +c ($\int\frac{dx}{x^2+1}=\tan^{-1}X\ And\ \int\frac{dy}{y+1}=$log($Y+1$)

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

3. Differentiate: $y = 4\sec t + \tan t$

SOLLUTION:

$y = 4\sec t + \tan t$

Differentiating on both sides with respect to t ;we get,

$\frac{dy}{dt} = \frac{d(4\sec t+\tan t)}{dt}$

$or, \frac{dy}{dt} = 4\left[\frac{d(\sec t)}{dt}\right] + \frac{d(tant)}{dt}$

$or, \frac{dy}{dt} = 4\sec t. \tan t + \sec^2 t$

$Therefore, \frac{dy}{dt} = \sec t(4\tan t + \sec \quad t)$

4. If $\text{f}'' = 20\text{x}^3 - 12\text{x}^2 + 6\text{x}$ then find f(x) ?

We have,∫ f'(x) =F'(x) Now ,Integrating both sides, we get

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

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

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

$f'^{(x)} = 5x^4 - 4x^3 + 3x$ ^{2}+ C

Again, $\int f'^{(x)}$ = f(x)

Integrating on both sides, we get;

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

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

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

$\therefore f(x) = x^5 - x^4 + x^3$+ C

Q.n.5

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

SOLLUTION:

Given equation of a curve is $y = x^3 - 2x + 5$

Co-ordinates for lower limit and upper limit are , x=1 and 2.

$y = x^3 - 2x + 5$

y $=\int_1^2 (x^3 - 2x + 5)dx$

y $=\int_1^2 (x^3)dx - \int_1^2 2x\,dx + \int_1^2 5dx$

y=$\left[\frac{2^4}{4} - 2.\frac{2^2}{2} + 5 * 2\right]$-$\left[\frac{1^4}{4} - 2.\frac{1}{2} + 5 * 1\right]$

y= [4- 4+10]-[$\frac{1}{4} - 1 + 5$]

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

y=$\frac{24-1}{4}$

Therefore, y= $\frac{23}{4}$ i.e. Area= 5.75 sq.unit

The area enclosed between x-axis, for the curve y=$x^3 - 2x + 5$ is 5.75 sq.unit.

Q.n.6 Find $\int \frac{dx}{e^x+1}$ (Antiderivatives)

SOLLUTION

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

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

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

=x $-$ ln$(e^x + 1)$+c

Q.n.7 State and Verify mean value theorem for $f(x) = x^3 - x$ in [0,2]

SOLLUTION

_If f(x) be any function such that;

- F(x) is continuous on closed interval [a,b]
- f (x) is differentiable on open interval (a,b)

Then, there exists some number c in (a,b) such that,

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

For verification,

$f(x) = x^3 - x$ on [0,2]

Since, every polynomial function is continuous so f(x) is continuous.

Then, $f(0) = 0^3 - 0$

$= 0$

$f(2) = 2^3 - 2 = 6$

Now, $f'(x)\frac{dy}{dx} = \frac{d}{dx}(x^3 - x)$

$= 3x^2 - 1$

Then at [0,2]

$\frac{dy}{dx} = 3.0^2 - 1$

$= -1$

Again, according to mean value theorem,

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

Or, $3c^2 - 1 = \frac{6-0}{2-0}$

Or, $3c^2 - 1 = 3$

Or, $c^2 = \frac{4}{3}$

Or, $c = \pm\sqrt{\frac{4}{3}}$

$\therefore c = \pm\frac{2}{\sqrt{3}}$ But, $C = \frac{2}{\sqrt{3}}$ ε (0,2)

Hence, mean value theorem is verified.