Nabadwip Vidyasagar College
1st Internal Examination
Semester-I
CC-T-01

Full Marks:-20

Time:-40 Min

Answer all questions.

$4 \times 5 = 20$

1. Determine the concavity and the inflection points of the function f defined by $f(x) = 3x^4 - 4x^2 + 1$.

Or,

Find the value of the following limit:

$$\lim_{x \to 0} \left(\frac{\sin x}{x} \right)^{\frac{1}{x}}$$

2. Find out the reduction formula for $\int \sin^n x \, dx$

Or,

Find the exact arc length of the curve $24xy = y^4 + 48$ from $y = 2$ to $y = 4$.

3. A line makes angles α, β, γ and δ with the four diagonals of a cube. Show that,

$$\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma + \cos^2 \delta = \frac{4}{3}$$

Or,

Show that the straight lines whose direction cosines are given by $al + bm + cn = 0$ and $fmn + gnl + hlm = 0$ are perpendicular, if

$$\frac{f}{a} + \frac{g}{b} + \frac{h}{c} = 0$$

4. Determine integrating factor of

$$\frac{dy}{dx} + Py = Q$$

Where P,Q are constants or functions of x

Or,

Solve: $(x^2 + y^2 + x)dx + xydy = 0$