

Assignment 2 - EE1030

1

ee24btech11018 - D. Swaraj Sharma

1 E - SUBJECTIVE PROBLEMS

1. A curve 'C' passes through (2,0) and the slope at (x,y) as $\frac{(x+1)^2+(y-3)}{x+1}$. Find the equation of the curve. Find the area bounded by curve and x-axis in fourth quadrant. (2004 - 4Marks)
2. If length of tangent at any point on the curve $y = f(x)$ intercepted between the point and the x-axis in fourth quadrant. (2005 - 4Marks)

2 F - MATCH THE FOLLOWING

- 1) Match the statements/expressions in **Column I** with the open intervals in **Column II**. (2009)

Column I

Column II

- | | |
|--|---------------------------------------|
| (A) Interval contained on the domain of definition of non-zero solutions of the differential equation $(x-3)^2 + y' + y = 0$ | (a) $(-\frac{\pi}{2}, \frac{\pi}{2})$ |
| (B) Interval containing the value of the integral $\int_1^5 (x-1)(x-2)(x-3)(x-4)(x-5) dx$ | (b) $(0, \frac{\pi}{2})$ |
| (C) Interval in which at least one of the points of local maximum of $\cos^2 x + \sin x$ lies | (c) $(\frac{\pi}{8}, \frac{5\pi}{4})$ |
| (D) Interval in which $\tan^{-1}(\sin x + \cos x)$ is increasing | (d) $(0, \frac{\pi}{8})$ |
| | (e) $(-\pi, \pi)$ |

3 H - ASSERTION & REASON TYPE QUESTIONS

- 1) Let solution $y = y(x)$ of the differential equation $x\sqrt{x^2-1}dy - y\sqrt{y^2-1}dx = 0$ satisfy $y(2) = \frac{2}{\sqrt{3}}$.

STATEMENT-1: $y(x) = \sec(\sec^{-1} x - \frac{\pi}{6})$ and

STATEMENT-2: $y(x)$ is given by $\frac{1}{y} = \frac{2\sqrt{3}}{x} - \sqrt{1 - \frac{1}{x^2}}$ (2008)

- a) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 is a correct explanation for STATEMENT-1
- b) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 is **NOT** a correct explanation for STATEMENT-1
- c) STATEMENT-1 is True, STATEMENT-2 is False
- d) STATEMENT-2 is False, STATEMENT-2 is True

4 I - INTEGER VALUE CORRECT TYPE

- 1) Let $y'(x) + y(x)g'(x) = g(x)$, $g'(x), y(0) = 0$, $x \in \mathbb{R}$, where $f'(x)$ denotes $\frac{df(x)}{dx}$ and $g(x)$ is a given non-constant differentiable function on \mathbb{R} with $g(0) = g(2) = 0$. Then the value of $y(2)$ is (2011)
- 2) Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be a differentiable function with $f(0) = 0$. If $y = f(x)$ satisfies the differential equation $\frac{dy}{dx} = (2 + 5y) + (5y - 2)$, then the value of $\lim_{x \rightarrow -\infty} f(x)$ is. (JEE Adv. 2018)
- 3) Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be a differentiable function with $f(0) = 1$ and satisfying the differential equation $f(x + y) = f(x)f'(y) + f'(y)f(x)$ for all $x, y \in \mathbb{R}$ then, the value of $\log_e (f(4))$ is. (JEE Adv. 2018)

5 SECTION-B // JEE MAIN / AIEEE

- 1) The order and degree of the differential equation $\left(1 + 3\frac{dy}{dx}\right)^{\frac{2}{3}} = 4\frac{d^3y}{dx^3}$ are [2002]
- a) $\left(1, \frac{2}{3}\right)$ c) (3, 3)
b) (3, 1) d) (1, 2)
- 2) The solution of the equation $\frac{d^2y}{dx^2} = e^{-2x}$ [2002]
- a) $\frac{e^{-2x}}{4}$ c) $\frac{1}{4}e^{-2x} + cx^2 + d$
b) $\frac{e^{-2x}}{4} + cx + d$ d) $\frac{1}{4}e^{-4x} + cx + d$
- 3) The degree and order of the differential equation of the family of all parabolas whose axis x -axis, are respectively. [2003]
- a) 2, 3 c) 1, 2
b) 2, 1 d) 3, 2
- 4) The solution of the differential equation $(1 + y^2) + (x - e^{\tan^{-1}y})\frac{dy}{dx} = 0$, is [2003]
- a) $xe^{2\tan^{-1}y} = e^{\tan^{-1}y} + k$ c) $2xe^{\tan^{-1}y} = e^{2\tan^{-1}y} + k$
b) $(x - 2) = ke^{2\tan^{-1}y}$ d) $xe^{\tan^{-1}y} = \tan^{-2}y + k$
- 5) The differential equation for the family of circle $x^2 + y^2 - 2ay = 0$, where a is an arbitrary constant is [2004]
- a) $(x^2 + y^2)y'/prime = 2xy$ c) $(x^2 - y^2)y'/prime = 2xy$
b) $2(x^2 + y^2)y'/prime = xy$ d) $2(x^2 - y^2)y'/prime = xy$
- 6) Solution of the differential equation $ydx + (x + x^2y)dy = 0$ is [2004]

a) $\log y = Cx$

c) $\frac{1}{xy} + \log y = C$

b) $-\frac{1}{xy} + \log y = C$

d) $-\frac{1}{xy} = C$

7) The differential equation representing the family of curves $y^2 = 2c(x + \sqrt{c})$, where $c > 0$, is a parameter, is of order and degree as follows: [2005]

a) order 1, degree 2

c) order 1, degree 3

b) order 1, degree 1

d) order 2, degree 2

8) If $x \frac{dy}{dx} = y(\log y - \log x + 1)$, then the solution of the equation is [2005]

a) $y \log\left(\frac{x}{y}\right) = cx$

c) $\log\left(\frac{y}{x}\right) = cx$

b) $y \log\left(\frac{y}{x}\right) = cy$

d) $\log\left(\frac{x}{y}\right) = cy$