RATE OF CHANGE

PREVIOUS EAMCET BITS

1. A stone thrown upwards, has its equation of motion $s = 490t - 4.9t^2$. Then the maximum height reached by it is **[EAMCET 2005]**

   1) 24500 2) 12500 3) 12250 4) 25400

   Ans: 3

Sol. $S = 490t - 4.9t^2$

$v = \frac{ds}{dt} = 490 - 9.8t$

at maximum height $v = 0$

$\therefore t = 50$

$\therefore S = 12250$

2. A particle moves along the curve $y = x^2 + 2x$. Then the point on the curve such that x and y coordinates of the particle change with the same rate: **[EAMCET 2004]**

   1) (1, 3) 2) $\left(\frac{1}{2}, \frac{5}{2}\right)$ 3) $\left(-\frac{1}{2}, -\frac{3}{4}\right)$ 4) $(-1, -1)$

   Ans: 3

Sol. $\frac{dy}{dt} = (2x + 2)\frac{dx}{dt}$

$\Rightarrow x = \frac{-1}{2} \quad \left(\because \frac{dy}{dt} = \frac{dx}{dt}\right)$

$y = \frac{-3}{4}$

$\therefore (x, y) = \left(\frac{-1}{2}, \frac{-3}{4}\right)$

69. A point is moving on $y = 4 - 2x^2$. The x-coordinate of the point is decreasing at the rate of 5 units per second. Then the rate at which 'y'-coordinate of the point is changing when the point is (1, 2) is **[EAMCET 2004]**

   1) 5 units/sec 2) 10 units/sec 3) 15 units /sec 4) 20 units/ sec

   Ans: 4

Sol. $y = 4 - 2x^2 \Rightarrow \frac{dy}{dt} = -4x\frac{dx}{dt}$

$= 4(1)(-5) = 20 \text{ units/sec}$

3. Gas is being pumped into a spherical balloon at the rate of 30 ft^3/ min. Then the rate at which the radius increases when it reaches the value 15 ft is **[EAMCET 2003]**

   1) $\frac{1}{30\pi}$ ft/min 2) $\frac{1}{15\pi}$ ft/min 3) $\frac{1}{20}$ ft/min 4) $\frac{1}{25}$ ft/min

   Ans: 1

Sol. $v = \frac{4}{3}\pi r^3 \Rightarrow \frac{dv}{dt} = 4\pi r^2 \frac{dr}{dt}$

$30 = 4\pi(15)^2 \frac{dr}{dt} \Rightarrow \frac{dr}{dt} = \frac{1}{30\pi}$ ft/min

4. The family of curves, in which the substangent at any point to any curve is double the abscissa, is given by **[EAMCET 2001]**

1) $x = cy^2$ 2) $y = cx^2$ 3) $x^2 = cy^2$ 4) $y = cx$

Ans: 1

Sol. Let $x = cy^2 \Rightarrow \frac{dy}{dx} = \frac{1}{2cy}$

$\Rightarrow$ Subtangent $= \frac{y}{1/2cy} = 2cy^2 = 2x$

5. The distance moved by the particle in time t is given by $x = t^3 - 12t^2 + 6t + 8$. At the instant, when its acceleration is zero, the velocity is **[EAMCET 2000]**

1) 42 2) – 42 3) 48 4) – 48

Ans: 2

Sol. $S = t^3 - 12t^2 + 6t + 8$

$V = \frac{ds}{dt} = 3t^2 - 24t + 6$

$a = \frac{dv}{dt} = 6t - 24 = 0 \Rightarrow t = 4$

$\therefore\ t = 4 \Rightarrow \upsilon = -42$