NUMERICAL INTEGRATION

PREVIOUS EAMCET BITS

1. The lines $x=\frac{\pi}{4}$ divides the area of the region bounded by y = sinx, y = cosx and x-axis $\left(0\le x\le\frac{\pi}{2}\right)$ into two regions of area A_1 and A_2. The $A_1 : A_2$: **[EAMCET 2009]**

   1) 4 : 1 2) 3 : 1 3) 2 : 1 4) 1 : 1

   Ans: 4

Sol. $A_1=\int_0^{\pi/4}(\cos x-\sin x)dx$

$A_2=\int_{\pi/4}^{\pi/2}(\sin x-\cos x)dx$

$\therefore\ A_1:A_2=1:1$

2. The velocity of a particle which starts from rest is given by the following table

t (in seconds) :	0	2	4	6	8	10
v (in m/sec) :	0	12	16	20	35	60

The total distance travelled (in meters) by the particle in 10 seconds, using Trapezoidal rule is given by **[EAMCET 2009]**

1) 113 2) 226 3) 143 4) 246

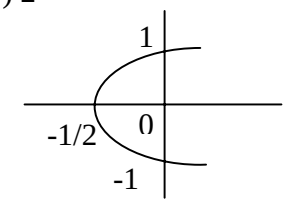
Ans: 2

Sol. Distance travelled = $\frac{h}{2}\left[(y_0+y_n)+2(y_1+y_2+.....+y_{n-1})\right]$

3. The area (in square units) of the region bounded by the curve $2x = y^2 - 1$ and x = 0 is **[EAMCET 2008]**

   1) $\frac{1}{3}$ 2) $\frac{2}{3}$ 3) 1 4) 2

   Ans: 2



Sol. Area of the region = $-\int_{-1}^{1}\frac{y^2-1}{2}dy=-\int_0^1(y^2-1)dy$

$=-\left[\frac{y^3}{3}-y\right]_0^1=\frac{2}{3}$ sq.units

4. The area (in square units) of the region enclosed by the curves $y = x^2$ and $y = x^3$ is **[EAMCET 2007]**

   1) $\frac{1}{12}$ 2) $\frac{1}{6}$ 3) $\frac{1}{3}$ 4) 1

   Ans: 1

Sol. $x^2=x^3$

$x^2-x^3=0\Rightarrow x^2(x-1)=0\Rightarrow x=0,1$

$\therefore$ Area $= \int_0^1 \left(x^2 - x^3\right)dx = \left[\frac{x^3}{3} - \frac{x^4}{4}\right]_0^1 = \frac{1}{12}$ sq.units

5. Dividing the interval [0, 6] into 6 equal parts and by using trapezoidal rule the value of $\int_0^6 x^3 dx$ is approximately. **[EAMCET 2006]**

1) 330 2) 331 3) 332 4) 333

Ans: 4

Sol. a = 0, b = 6; n = 6; $y_n = a + (r - 1)h$

$h = \frac{b-a}{n} = 1$

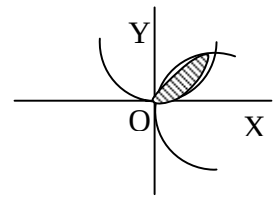
$\int_0^6 x^3 dx = \frac{h}{2}\left[\left(y_0 + y_6\right) + 2\left(y_1 + y_2 + y_3 + y_4 + {}_5\right)\right] = 333$

6. The area (in square units) bounded by the curves $y^2 = 4x$ and $x^2 = 4y$ in the plane is **[EAMCET 2005]**

1) $\frac{8}{3}$ 2) $\frac{16}{3}$ 3) $\frac{32}{3}$ 4) $\frac{64}{3}$

Ans: 2

Sol. Area bounded by the curves $y^2 = 4ax$ and $x^2 = 4by$ is $\frac{16ab}{3}$



where $a = 1, b = 1$

$\therefore$ Area $= \frac{16}{3}$ sq.units

7. The area bounded by $y = x^2 + 2$, x-axis, x = 1 an x = 2 is **[EAMCET 2004]**

1) $\frac{16}{3}$ 2) $\frac{17}{3}$ 3) $\frac{13}{3}$ 4) $\frac{20}{3}$

Ans: 3

Sol. $\int_1^2 \left(x^2 + 2\right)dx = \frac{13}{3}$

8. If [2, 6] is divided into four intervals of equal length, then the approximate value of $\int_2^6 \frac{1}{x^2 - x}dx$ by using Simpson's rule is **[EAMCET 2003]**

1) 0.3222 2) 0.2333 3) 0.5222 4) 0.2555

Ans: 3

Sol. $\int_2^6 \frac{1}{x^2 - x}dx$

$\frac{(6-2)}{3.4}\left[\left(y_0 + y_4\right) + 4\left(y_1 + y_3\right) + 2y_2\right] = 0.5222$

9. The approximate value of $\int_1^9 x^2 dx$ by using trapezoidal rule with equal, intervals is **[EAMCET 2002]**

1) 248 2) 242.5 3) 242.8 4) 243

Ans: 1

Sol. $h = \frac{b-a}{n} = \frac{9-1}{4} = 2$

x	1	3	5	7	9
$y = x^2$	1	9	25	49	81

$\int_1^9 x^2 dx = \frac{2}{2}\left[(1+81)+2(9+25+49)\right] = (82 + 166) = 248$

10.

X	1	2	3	4
Y	0.7111	0.7222	0.7333	0.7444

Using the above table and trapezoidal rule, the approximately value of $\int_1^4 y dx$ is **[EAMCET 2001]**

1) 0.1833 2) 1.1833 3) 2.1833 4) 3.1833

Ans:3

Sol. Trapezoidal rule = $\int_a^b f(x)dx = \frac{h}{2}\left[(y_0 + y_n) + 2(y_1 + y_2 + ... + y_{n-1})\right]$

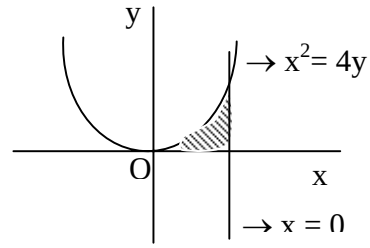
Where $h = \frac{b-a}{n}$

$\therefore \int_1^4 y dx = \frac{1}{2}(0.7111 + 0.7444) + 2(0.7222 + 0.7333) = 2.1833$

11. The area (in square units) of the region bounded by the curve $x^2 = 4y$, the line x = 2 and the X-axis is **[EAMCET 2000]**

1) 1 2) $\frac{2}{3}$

3) $\frac{4}{3}$ 4) $\frac{8}{3}$



Ans: 2

Sol. $\int_0^2 y dx = \int_0^2 \frac{x^2}{4} dx = \frac{2}{3}$

12. The area (in square units) bounded by the curves $y = x^3$, $y = x^2$ and the ordinates x = 1, x = 2 is **[EAMCET 2000]**

1) $\frac{17}{12}$ 2) $\frac{12}{17}$ 3) $\frac{2}{7}$ 4) $\frac{7}{2}$

Ans: 1

Sol. $\int_1^2 (x^3 - x^2) dx = \frac{17}{12}$