# QB365 Question Bank Software

**12th Maths CBSE Case Study Application of Integrals Questions For - 2024**

12th Standard

**Maths**

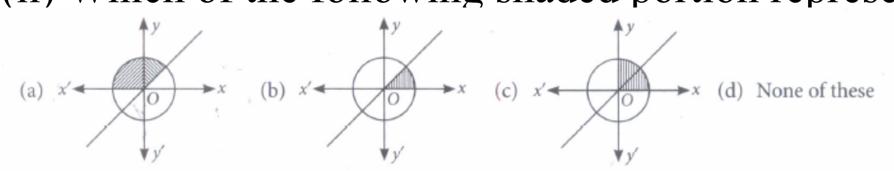
**SECTION-A** 2 x 4 = 8

1) Consider the curve $x^2 + y^2 = 16$ and line y = x in the first quadrant. Based on the above information, answer the following questions.

(i) Point of intersection of both the given curves is

**(a)** **(0, 4)** **(b)** $(0, 2\sqrt{2})$ **(c)** $(2\sqrt{2}, 2\sqrt{2})$ **(d)** $(2\sqrt{2}, 4)$

(ii) Which of the following shaded portion represent the area bounded by given two curves?




(iii) The value of the integral $\int_0^{2\sqrt{2}} x dx$ is

**(a) 0** **(b) 1** **(c) 2** **(d).4**

(iv) The value of the integral $\int_{2\sqrt{2}}^{4} \sqrt{16 - x^2} dx$ is

(a) $2(\pi - 2)$ (b) $2(\pi - 8)$ (c) $4(\pi - 2)$ (d) $4(\pi + 2)$

(v) Area bounded by the two given curves is

(a) $3\pi$ sq. units (b) $\frac{\pi}{2}$ sq. units (c) $\pi$ sq. units (d) $2\pi$ sq. units

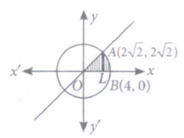
**Answer : (i) (c) :** We have, $x^2 + y^2 = 16$ ..(i)

and y = x ...(ii)

From (i) and (ii), $2x^2 = 16 \Rightarrow x^2 = 8 \Rightarrow x = 2\sqrt{2}$ ($\because$ x lies in first quadrant)

$\therefore$ Point of intersection of (i) and (ii) in first quadrant is $(2\sqrt{2}, 2\sqrt{2})$ .

**(ii) (b) :** The shaded region which represent the areabounded by two given curves in first quadrant is shown below.



**(iii)( d) :** $\int_0^{2\sqrt{2}} x dx = \left[\frac{x^2}{2}\right]_0^{2\sqrt{2}} = \frac{(2\sqrt{2})^2}{2} = \frac{8}{2} = 4$

**(iv) (a) :** $\int_{2\sqrt{2}}^{4} \sqrt{16 - x^2} dx = \left[\frac{x}{2}\sqrt{16 - x^2} + \frac{16}{2} \cdot \sin^{-1}\left(\frac{x}{4}\right)\right]_{2\sqrt{2}}^{4}$

$= 8\sin^{-1}(1) - 4 - 8\sin^{-1}\left(\frac{1}{\sqrt{2}}\right)$

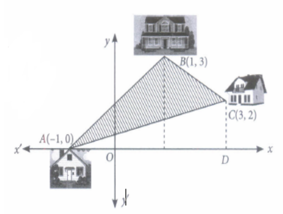
$= 8\left(\frac{\pi}{2}\right) - 4 - 8\left(\frac{\pi}{4}\right) = 4\pi - 4 - 2\pi = 2\pi - 4 = 2(\pi - 2)$

**(v) (d) :** Required area = Area (OLA) + Area (BAL)

$= \int_0^{2\sqrt{2}} x dx + \int_{2\sqrt{2}}^{4} \sqrt{16 - x^2} dx$

$= 4 + 2(\pi - 2) = 2\pi$ sq. units.

2) Location of three houses of a society is represented by the points A(-1, 0), B(1, 3) and C(3, 2) as shown in figure. Based on the above information, answer the following questions




(i) Equation of line AB is

**(a)** $y = \frac{3}{2}(x+1)$ **(b)** $y = \frac{3}{2}(x-1)$ **(c)** $y = \frac{1}{2}(x+1)$ **(d)** $y = \frac{1}{2}(x-1)$

(ii) Equation of line BC is

**(a)** $y = \frac{1}{2}x - \frac{7}{2}$ **(b)** $y = \frac{3}{2}x - \frac{7}{2}$ **(c)** $y = \frac{-1}{2}x + \frac{7}{2}$ **(d)** $y = \frac{3}{2}x + \frac{7}{2}$

(iii) Area of region ABCD is

**(a) 2 sq. units** **(b) 4 sq. units** **(c) 6 sq. units** **(d) 8 sq. units**

(iv) Area of $\Delta ADC$ is

**(a) 4 sq. units** **(b) 8 sq. units** **(c) 16 sq. units** **(d) 32 sq. units**

(iv) Area of $\Delta ABC$ is

**(a) 3 sq. units** **(b) 4 sq. units** **(c) 5 sq. units** **(d) 6 sq. units**

**Answer : (i) (a) :** Equation of line AB is

$y - 0 = \frac{3-0}{1+1}(x+1) \Rightarrow y = \frac{3}{2}(x+1)$

**(ii) (c) :** Equation of line BC is $y - 3 = \frac{2-3}{3-1}(x-1)$

$\Rightarrow y = -\frac{1}{2}x + \frac{1}{2} + 3 \Rightarrow y = \frac{-1}{2}x + \frac{7}{2}$

**(iii) (d) :** Area of region ABCD

= Area of $\triangle ABE$ + Area of region BCDE

$= \int_{-1}^{1} \frac{3}{2}(x+1)dx + \int_{1}^{3} \left(\frac{-1}{2}x + \frac{7}{2}\right) dx$

$= \frac{3}{2}\left[\frac{x^2}{2} + x\right]_{-1}^{1} + \left[\frac{-x^2}{4} + \frac{7}{2}x\right]_{1}^{3}$

$= \frac{3}{2}\left[\frac{1}{2} + 1 - \frac{1}{2} + 1\right] + \left[\frac{-9}{4} + \frac{21}{2} + \frac{1}{4} - \frac{7}{2}\right]$

= 3 + 5 = 8 sq. units

**(iv) (a) :** Equation of line AC is $y - 0 = \frac{2-0}{3+1}(x+1)$

$\Rightarrow y = \frac{1}{2}(x+1)$

$\therefore$ Area of $\Delta ADC = \int_{-1}^{3} \frac{1}{2}(x+1)dx = \left[\frac{x^2}{4} + \frac{1}{2}x\right]_{-1}^{3}$

$= \frac{9}{4} + \frac{3}{2} - \frac{1}{4} + \frac{1}{2} = 4$ sq. units

**(v) (b) :** Area of $\Delta ABC$= Area of region ABCD - Area of $\Delta ACD = 8 - 4 = 4$sq. units