

Lecture 3Definite integration.Related problem with solution.

Ques the area of the region bounded by parabola  $(y-2)^2 = x-1$  the tangent to the parabola at point  $(2,3)$  and the  $x$ -axis is

(a) 9

(b) 12

(c) 3

(d) 6.

Solu:-  $(y-2)^2 = (x-1)$  — (1)

or  $(y-2)$

So diff. equation (1) w.r.t  $x$ ,

$$2(y-2) \frac{dy}{dx} = 1$$

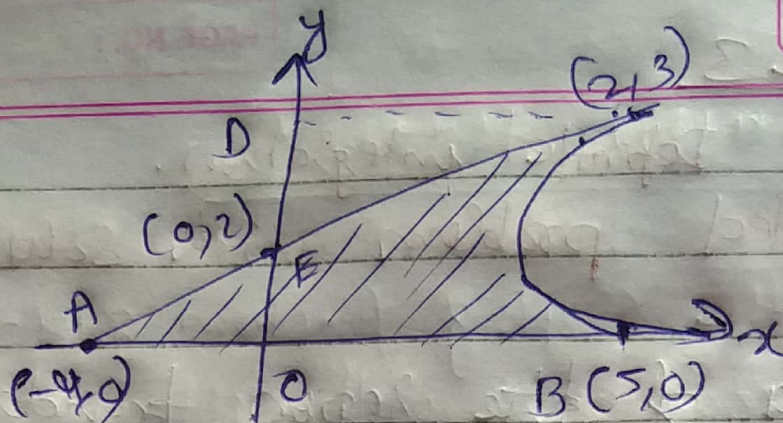
So

$$\frac{dy}{dx} = \frac{1}{2(y-2)} \Rightarrow \frac{dy}{dx} \Big|_{(2,3)} = \frac{1}{2}$$

So equation of tangent at  $(2,3)$  is

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

$$\Rightarrow x-2y+4=0.$$



∴ Area of part AEO =  $\frac{1}{2} \times 4 \times 2 = 4$  sq. unit

Area of part OBCDO

$$= \int_0^3 x dy = \int_0^3 ((y-2)^2 + 1) dy = \left[ \frac{(y-2)^3}{3} + y \right]_0^3$$

$$= 6 \text{ sq. unit}$$

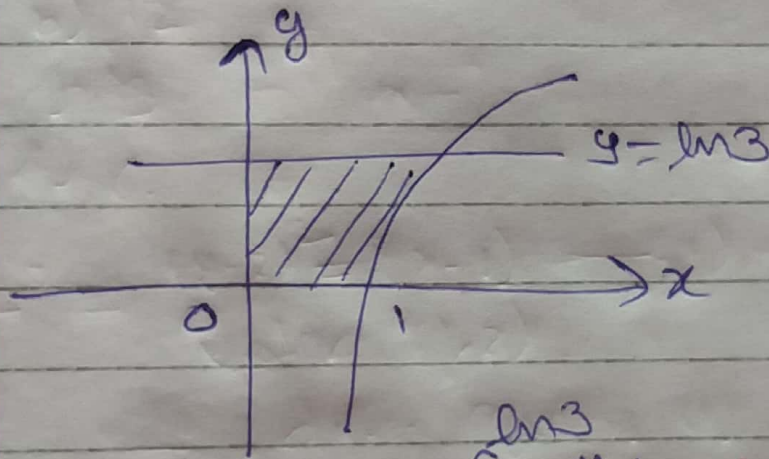
∴ Area of part DCE =  $\frac{1}{2} \times 1 \times 2 = 1$  sq. unit

shaded area =  $6 + 4 - 1 = 9$  sq. unit.

Ques 2

The area bounded by the curve  $y = \ln(x)$  and the line  $y=0$ ,  $y = \ln(3)$  and  $x=0$  is equal to.

- (a)  $\ln(3) - 2$   
(b) 3  
(c) 2  
(d)  $3\ln 3 + 2$ .

Ans:-

$$\therefore \text{area} = \int_0^{\ln 3} e^y dy = 2.$$