

27) A differential equation representing the family of parabolas with axis parallel to y-axis and whose length of latus rectum is the distance of the point  $(2, -3)$  from the line  $3x + 4y = 5$  is given by:

solution: since the length of the latus rectum is the distance of the point  $(2, -3)$  from the line  $3x + 4y = 5$ .

$$4a = \frac{|3(2) + 4(-3) - 5|}{5} = \frac{11}{5}$$

$$\therefore (x-h)^2 = \frac{11}{5} (y-k) \quad \text{--- (1)}$$

Differentiate (1) w.r.t. 'x' we get

$$2 = \frac{11}{5} \frac{d^2y}{dx^2}$$

Again differentiating w.r.t. x, we get

$$2 = \frac{11}{5} \frac{d^2y}{dx^2} \Rightarrow \boxed{\frac{11d^2y}{dx^2} = 10}$$