



$$\begin{cases} y = m(x-1) & \text{--- ①} \\ y^2 = 4x & \text{--- ②} \end{cases}$$

sub ① into ②:

$$m^2(x-1)^2 = 4x$$

$$m^2(x^2 - 2x + 1) = 4x$$

$$m^2x^2 - 2m^2x + m^2 = 4x$$

$$m^2x^2 + (-2m^2 - 4)x + m^2 = 0$$

$$\alpha + \beta = \frac{2m^2 + 4}{m^2}$$

$$\alpha\beta = \frac{m^2}{m^2} = 1$$

$$x = \frac{2m^2 + 4 \pm \sqrt{(-2m^2 - 4)^2 - 4(m^2/m^2)}}{2m^2}$$

$$= \frac{2m^2 + 4 \pm \sqrt{16m^2 + 16}}{2m^2}$$

$$= \frac{2m^2 + 4 \pm 4\sqrt{m^2 + 1}}{2m^2}$$

$$= \frac{m^2 + 2 \pm 2\sqrt{m^2 + 1}}{m^2}$$

$$\text{general point } x \text{ for locus} \\ = \frac{\alpha + \beta}{2} = \frac{2m^2 + 4}{2m^2} = \frac{m^2 + 2}{m^2}$$

from ②:

$$x = \frac{y^2}{4}$$

sub into ①:

$$y = m\left(\frac{y^2}{4} - 1\right)$$

$$0 = \frac{m}{4}y^2 - y - m$$

$$\alpha' + \beta' = \frac{y}{\frac{m}{4}} = \frac{4y}{m} \\ = \frac{-1}{\frac{m}{4}} = -\frac{4}{m}$$

general point y for locus

$$= \frac{\alpha' + \beta'}{2} = -\frac{4}{2m} = -\frac{2}{m}$$

$$\begin{cases} y = -\frac{2}{m} & \text{--- ③} \\ x = \frac{m^2 + 2}{m^2} = 1 + \frac{2}{m^2} & \text{--- ④} \end{cases}$$

$$\text{from ③: } m = -\frac{2}{y}$$

sub into ④:

$$x = 1 + \frac{2}{\left(-\frac{2}{y}\right)^2}$$

$$x = 1 + \frac{2y^2}{4}$$

$$4x - 4 = 2y^2$$

$$y^2 = 2x - 2$$