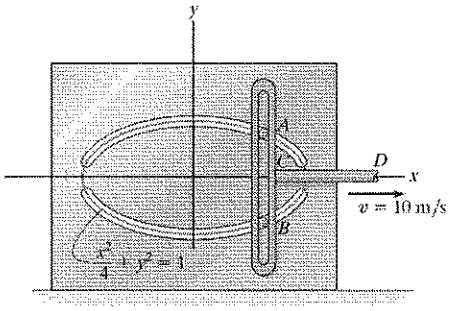
PROBLEM: AP-8

GIVEN:

Pegs A and B are restricted to move in the elliptical slots due to the motion of the slotted link. If the link moves with a constant speed of 10 m/s, determine the magnitude of the velocity and acceleration of peg A when $x = 1$ m.



REQUIRED:

$|v|$

$|a|$

SOLUTION:

$x = 1 \quad y = \sqrt{\frac{3}{4}}$

$v_x = 10$ m/s

$a_x = 0$

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

$$\frac{d}{dt} \Rightarrow \frac{2x}{4}(\dot{x}) + 2y(\dot{y}) = 0$$

$$\frac{1}{2} x v_x + 2y v_y = 0 \qquad v_y = 2.88 \downarrow \text{ m/s}$$

$$\frac{d^2}{dt^2} \Rightarrow \frac{1}{2}(\dot{x}\dot{x} + x\ddot{x}) + 2(\dot{y}\dot{y} + y\ddot{y}) = 0$$

$$\frac{1}{2}(v_x^2 + x(a_x)) + 2(v_y^2 + y(a_y)) = 0$$

$$a_y = 38.5 \downarrow$$

$$v = \sqrt{10^2 + 2.88^2} = 10.4 \text{ m/s}$$

$$a = \sqrt{0^2 + 38.5^2} = 38.5 \text{ m/s}^2$$

$$\boxed{v = 10.4 \text{ m/s} \qquad a = 38.5 \text{ m/s}^2}$$