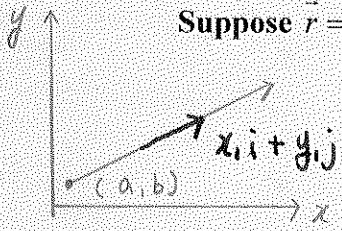


The Velocity Vector of a Moving Object:



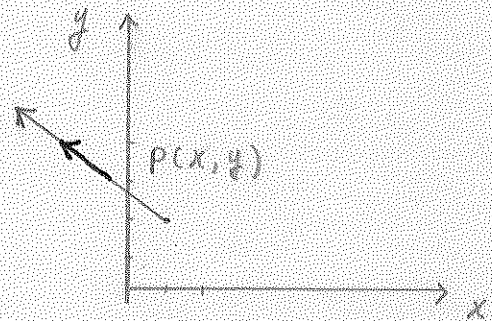
Suppose $\vec{r} = \begin{pmatrix} a \\ b \end{pmatrix} + t \begin{pmatrix} x_1 \\ y_1 \end{pmatrix}$ is a vector equation of the path of an object.

Initial Position: (a, b)
Speed: $\sqrt{x_1^2 + y_1^2}$
Velocity Vector: $v = x_1 i + y_1 j$

Example 1) A particle at P (x(t), y(t)) moves such that $x(t) = 2 - 3t$ and $y(t) = 4 + 2t$ where $t \geq 0$. Time is in seconds and distance is in meters.

a. Find the initial position of P?

(2, 4)



b. Find the positions of P for t=1 and t=2.

$(x, y)_{t=1} \Rightarrow (-1, 6)$

$(x, y)_{t=2} \Rightarrow (-4, 8)$

c. Find the speed (meters/second).

$\sqrt{3^2 + 2^2} = \sqrt{13} \text{ m/s.}$

Example 2) An object is initially at (5, 10) and moves with velocity vector $3i - j$ meters per minute.

a) Find the position of the object at time t minutes.

$x = 5 + 3t$

$y = 10 - t$

b) Find the position of the object at t=3 minutes.

$(x, y)_{t=3} = (14, 7)$

c) Find the time and the position when the object is due east of (0, 0).

$y = 0 \Rightarrow t = 10$

$x = 5 + 3 \cdot 10 = 35$

$\Rightarrow (35, 0)$ when $t = 10$

