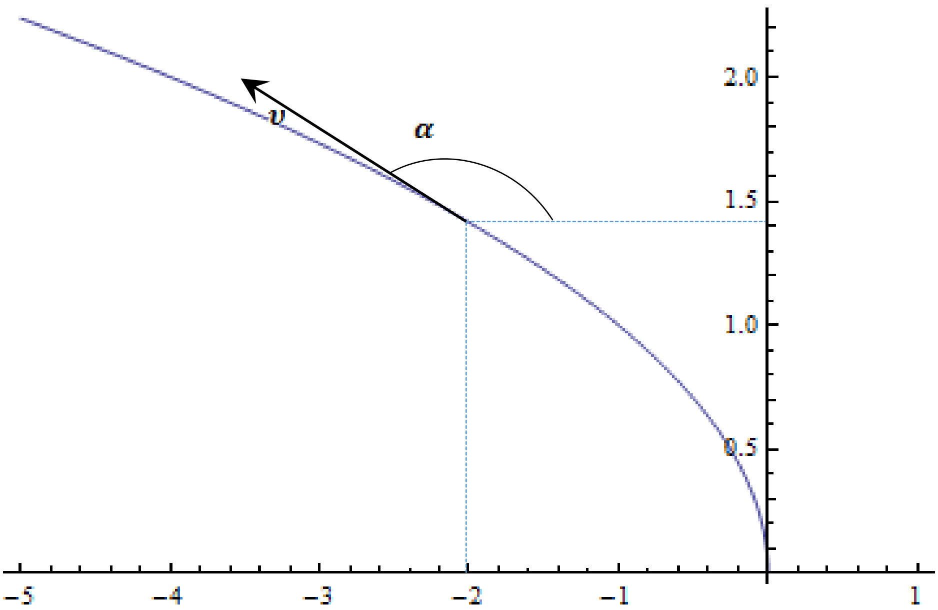
Problem:

I am looking for assistance in starting to solve this problem. Dont need the answer but a methodology for figuring it out on my own. A particle moves from right to left along the parabolic curve y = square root of -x in such a way that its x coordinates decreases at the rate of 4 meters per second. How fast is the angle of inclination in degrees of the line joining the particle to the origin changing when x = -2?

Solution:



According to the problem statement:

$$y = \sqrt{-x} \qquad (1)$$

And

$$v = \frac{dx}{dt} = -4\ m/s \qquad (2)$$

After differentiation of the first equation:

$$\frac{dy}{dx} = tg\alpha = -\frac{1}{2\sqrt{-x}} \qquad (3)$$

Where α – angle of inclination.

Differentiation of the equation (3) with respect to time t gives:

$$\frac{d(tg\alpha)}{dt} = \frac{1}{cos^2\alpha}\frac{d\alpha}{dt} = -\frac{1}{4}(-x)^{-\frac{3}{2}}\frac{dx}{dt} \Rightarrow$$

$$\frac{d\alpha}{dt} = \frac{cos^2\alpha}{4}(-x)^{-\frac{3}{2}}v \qquad (4)$$

From equation (3) we get:

$$cos^2\alpha = \frac{1}{1 + tg^2\alpha} = \frac{1}{1 + \frac{1}{-4x}} = \frac{4x}{4x - 1}$$

Then equation (4):

$$\frac{d\alpha}{dt} = \frac{x}{(4x-1)}(-x)^{-\frac{3}{2}}v$$

Since $x = -2$:

$$\frac{d\alpha}{dt} = \frac{-2}{(4*(-2)-1)}(2)^{-\frac{3}{2}} * (-4) = 0.31\ \frac{rad}{s} = 18\ \frac{degrees}{s}$$

Answer: $\frac{d\alpha}{dt} = 18\ \frac{degrees}{s}$ (at point x=-2).