A particle is moving along the curve y=x√. As the particle passes through the point (4,2), its x-coordinate increases at a rate of 3cm/s. How fast is the distance from the particle to the origin changing at this instant?

..... 3,02 cm/s

Solution
The key is to construct a right triangle to determine the path of the object.

$$z^2 = x^2 + y^2$$

When taken its derivative: $z\dfrac{dz}{dt} = x\dfrac{dx}{dt} + y\dfrac{dy}{dt}$

1. Using the point (4,2) solve for z (first equation)
$$z^2 = 4^2 + 2^2 = 20 \gg z = 4,47$$

2. Using y = sqrt(x), find dy/dt noting that x = 4 as dx/dt = 3 cm/s
$$\frac{dy}{dt} = y' \times \frac{dx}{dt} = \frac{0.5}{4^{0.5}} \times 3 = 0.75$$

3. From these, solve for dz/dt = rate of distance from particle to origin.
first take the derivative of the function

$$4{,}47\frac{dz}{dt} = 4 \times 3 + 2 \times 0.75 = 13.5 \gg \frac{dz}{dt} = \frac{13.5}{4{,}47} = 3{,}02\frac{cm}{s}$$