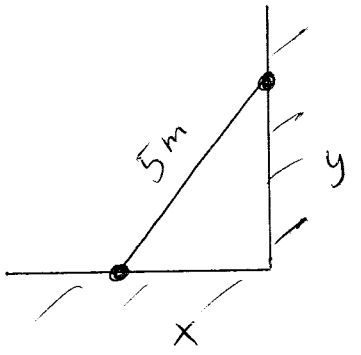
Calculus Worksheet: Rate of Change (2)

A 5 meter ladder leaning against a wall has its lower part moving away from the wall at the rate of 1 meter/second. At what speed is the top of the ladder moving down when the lower part of the ladder is 2 meters away from the wall?



$$x^2 + y^2 = 5^2$$

$$2x\frac{dx}{dt} + 2y\frac{dy}{dt} = 0$$

$\frac{dx}{dt} = 1$ m/sec (given)

$x = 2$ meters (given)

$y^2 = 5^2 - x^2 = 25 - 2^2 = 21 \Rightarrow y = \sqrt{21}$ m

Put values in differential equation.

$$2(2)\cdot 1 + 2\sqrt{21}\frac{dy}{dt} = 0$$

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$$\frac{dy}{dt} = \frac{-4}{2\sqrt{21}} \text{ m/s} \simeq -0.4 \text{ m/s}.$$