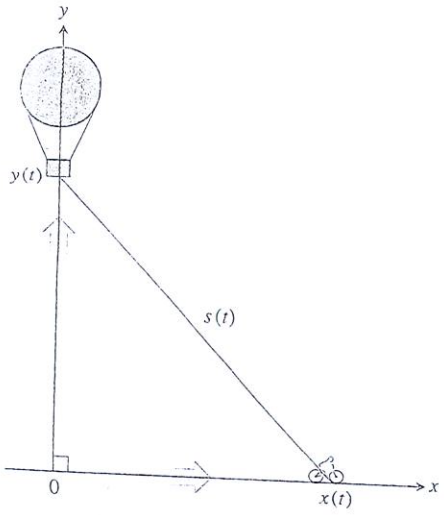
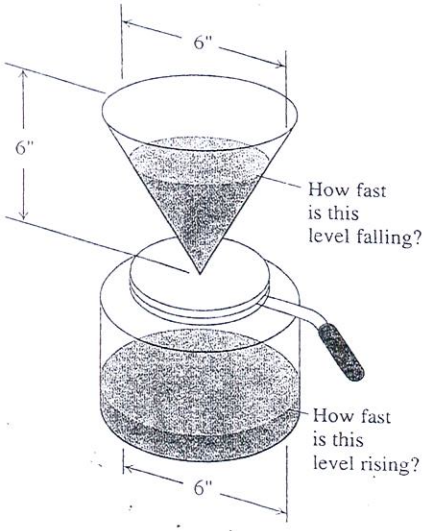
. *Rising Balloon* A balloon is rising vertically above a level, straight road at a constant rate of 1 ft/sec. Just when the balloon is 65 ft above the ground, a bicycle moving at a constant rate of 17 ft/sec passes under it. How fast is the distance between the bicycle and balloon increasing 3 sec later (see figure)?



. *Making Coffee* Coffee is draining from a conical filter into a cylindrical coffeepot at the rate of 10 in^3/min.

(a) How fast is the level in the pot rising when the coffee in the cone is 5 in. deep?

(b) How fast is the level in the cone falling at that moment?



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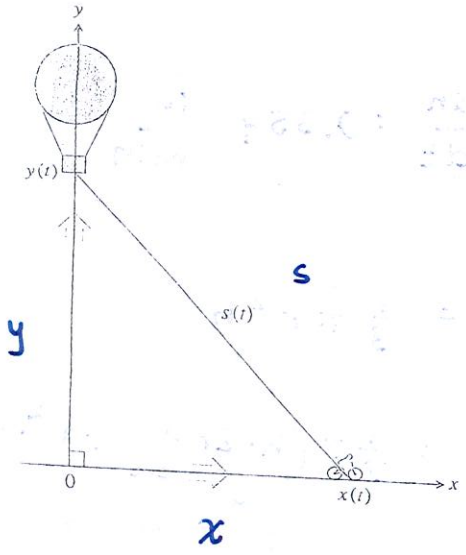

Equation: $x^2 + y^2 = s^2$

Derivative: $2x\frac{dx}{dt} + 2y\frac{dy}{dt} = 2s\frac{ds}{dt}$

Substitute: $51 \quad 17 \quad 68 \quad 1 \quad 85 \quad \text{Find}$

Solve: $\boxed{\frac{ds}{dt} = 11 \quad \frac{ft}{sec}}$

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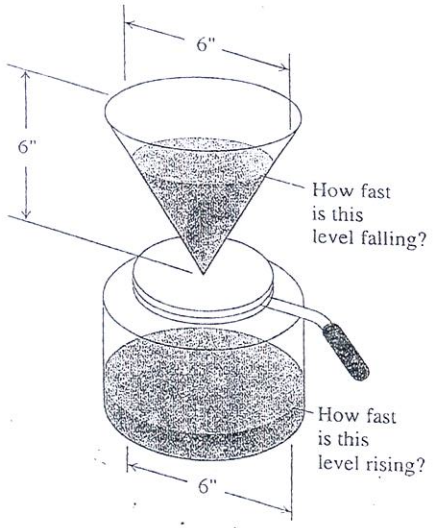

Equation: a. $V = \pi r^2 h$

Derivative: $\frac{dV}{dt} = \pi\left(h \cdot 2r\frac{dr}{dt} + r^2\frac{dh}{dt}\right)$

Substitute: 10 | 5 | 3 | 0 | 3 | Find

Solve: $\frac{dh}{dt} = 0.354 \ \frac{in}{min}$

Equation: b. $V = \frac{1}{3}\pi r^2 h$

realized missing $\frac{dr}{dt}$

$\frac{dV}{dt} = \frac{1}{3}\pi\left(h \cdot 2r\frac{dr}{dt} + r^2 \cdot \frac{dh}{dt}\right)$

-10 | 5 | 3 | ? | 3 | Find

Equation (simplified)

$V = \frac{1}{3}\pi\left(\frac{1}{2}h\right)^2 h$

$V = \frac{\pi}{12}h^3$

Derivative: $\frac{dV}{dt} = \frac{\pi}{4}h^2\frac{dh}{dt}$

Substitute: -10 | 5 | Find

Solve: