

## Worksheet 10/07: Related Rates.

18.01 Fall 2009

**Problem 1.** If  $y = x^3 + 2x$ , and  $dx/dt = 5$ , find  $dy/dt$  when  $x = 2$ .

**Problem 2.** You have two bowls. One of them is hemispherical. The other is conical, with a base radius equal to the height. Both bowls have the same base diameter of 30 cm.

You begin to pour water into both of them at the same rate of  $1 \text{ cm}^3/\text{s}$ . How fast is the level in each changing after 5 s?

**Problem 3.** Boyle's law for gases states that, at a constant temperature, the product of the pressure  $p$  and volume  $V$  of a gas is constant.

You have a liter container of gas that is at a pressure of  $1.2 * 10^4 \text{ N/m}^2$ . You begin compressing it, keeping the temperature constant, and changing the volume at an even rate of  $10^{-4} \text{ m}^3/\text{min}$ .

At what rate is the pressure changing when the volume is at 0.6 liters?

(1 liter = 0.001 cubic meters)

**Problem 4.** A (spherical) snowball melts at a rate proportional to its surface area. Show that its radius decreases at a constant rate.