Math 100:V02 – WORKSHEET 14
RELATED RATES

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(1) (Final 2018)
  (a) Particle A travels with a constant speed of 2 units per minute on the x-axis starting at the point $(4,0)$ and moving away from the origin, while particle B travels with a constant speed of 1 unit per minute on the y-axis starting at the point $(0,8)$ and moving towards the origin. Find the rate of change of the distance between the two particles when the distance between the two particles is exactly 10 units.

  (b) Same question, but swap the velocities of the particles (particle A moves along the y axis, particle B moves along the x-axis).

(2) A closed rectangular box has sides of lengths $4, 5, 6$cm. Suppose that the first and second sides are lengthening by $2\frac{\text{cm}}{\text{sec}}$ while the third side is shortening by $3\frac{\text{cm}}{\text{sec}}$.

(a) How fast is the volume changing?

(b) How fast is the surface area changing?

(c) How fast is the main diagonal changing?

(3) Baseball is played on a square $HABC$ of side length 90ft. A player runs from corner A to B. How fast is the player running, if when she is half-way between corners A, B their distance to corner C is decreasing at the rate of $3\sqrt{5}\,\frac{\text{ft}}{\text{s}}$?

(4) (CLP notes problem 3.2.2.14) The minute hand of a clock is 10cm long; the hour hand of the clock is 5cm long. How fast is the distance between the tips of the hands decreasing at 4 o'clock?

(5) (Final, 2015, variant) A conical tank of water is 6m tall and has radius 1m at the top.

(a) The drain is clogged, and is filling up with rainwater at the rate of $5\text{m}^3/\text{min}$. How fast is the water rising when its height is 5m?

(b) The drain is unclogged and water begins to drain at the rate of $(5 + \frac{\pi}{4})\text{m}^3/\text{min}$ (but rain is still falling). At what height is the water falling at the rate of 1m/min?