PS 2 Due 2/2/2017

An Exploration: Calculator Active

a. An ordinary soda can has a volume of 355 cm^3. Find the dimensions (radius and height) that minimize the surface area of such a can.
b. Do cans have this shape? If not, why is that? Any Guesses?
c. It is reasonable to estimate that the top of such a can is 3 times as thick as its sides. What sort of influence would that have on the design of a can?
d. For simplicity, pretend that the top is made of 3 layers of aluminum. Now minimize the surface area to find the optimal dimensions of a soda can.
e. Compare your answer in "d" to the actual dimensions of a real soda can.
f. Summarize your findings.

No Calculator:

A function f is defined by $f(x) = xe^{-2x}$ with domain $0 \le x \le 10$.

(a) Find all values of x for which the graph of f is increasing and all values of x for which the graph is decreasing.

(b) Give the x- and y-coordinates of all absolute maximum and minimum points on the graph of f. Justify your answers.

Calculator Active

The volume V of a cone $\left(V = \frac{1}{3}\pi r^2 h\right)$ is increasing at the rate of 28π cubic units per second. At the instant when the radius r of the cone is 3 units, its volume is 12π cubic units and the radius is increasing at $\frac{1}{2}$ unit per second.

(a) At the instant when the radius of the cone is 3 units, what is the rate of change of the area of its base?

(b) At the instant when the radius of the cone is 3 units, what is the rate of change of its height h?

(c) At the instant when the radius of the cone is 3 units, what is the instantaneous rate of change of the area of its base with respect to its height h?