1. A charged particle moves along the x-axis under the influence of an electric field. The field strength varies with time, and as a result the velocity of the particle is complicated. The position of the particle at time t is written as $x = x(t)$ and the velocity of the particle at time t is written as $v = v(t)$.
Suppose we know that $x(0) = 0$, and also that

$$v(t) = \begin{cases} 2t - 1, & \text{if } 0 \le t \le 1 \\ 4t - 3, & \text{if } 1 \le t \le 2 \\ 6t - 7, & \text{if } 2 \le t \le 3 \end{cases} .$$

What is $x(1)$? What is $x(2)$? What is $x(3)$? Sketch the graphs of $x = x(t)$ and $v = v(t)$.

2. Suppose $f(x) = 2x^2 - x^3$ and $g(x) = \sin\left(\frac{\pi x}{2}\right)$.

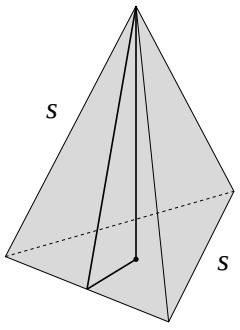
a) Use your calculator to sketch the two functions $y = f(x)$ and $y = g(x)$ on the interval $[0, 2]$. Note all the points of intersection as precisely as you can.

b) What is the exact value of $\int_0^2 f(x) - g(x)\,dx$? Find a numerical approximation of this value. What does the value of this integral tell you about the areas of the regions between the two graphs?

3. Which has more area, the region in the first quadrant enclosed by the line $x + y = 1$ and the circle $x^2 + y^2 = 1$, or the region in the first quadrant enclosed by the line $x + y = 1$ and the curve $\sqrt{x} + \sqrt{y} = 1$? Justify your answer. Include a sketch of the regions discussed.

4. Find the volume V of a *regular* tetrahedron whose face is an equilateral triangle of side s (as in the figure shown).

This is a problem from the textbook: #17 in section 6.2.



One problem will be selected for a writeup to be handed in at the next recitation meeting. Please see Professor Greenfield's Math 152 webpage to learn which problem to hand in.