Homework Sections 7.4.

I. Read Exercise 26 page 400. Let $F(t)$ be the function that models the volume of oxygen that has been inhaled by the bicyclist in this problem after t minutes. The graph given is the graph of $F'(t)$.

A. What are the units $F(t)$? on $F'(t)$? on $\int_0^{20} F'(t)\,dt$?

B. Estimate the total volume of oxygen inhaled in the first 20 minutes after the beginning of the ride, using rectangles with widths of 1 minute. Use the left end point of each 1-minute interval to calculate the height of your rectangle (see Figure 8 page 390 for a diagram of an example of a left-endpoint approximation).

C. The upshot of this problem is that the Fundamental Theorem of Calculus, which says $\int_a^b F'(t)\,dt = F(b) - F(a)$, tells us that if we integrate the rate of change of a function $\left(\text{i.e. calculate} \int_a^b F'(t)\,dt\right)$, we get the net change of the function (which is $F(b)$-$F(a)$). Write an integral that represents the total volume of oxygen inhaled by the bicyclist between 2 and 4 minutes.

II. Read problem 54 page 411.

A. Part (a) of this problem is asking you to change the units on time. Use the following outline to write your solution to this part:

1. Write "Let $g(t)$ be the function that yields the number of years in t days." This means that if you plug in a number of days, you'll get the equivalent number of years. For example $g(365)=1$, since 365 days is 1 year, and $g(1)=1/365$, since one day is a 365^{th} of a year. Write a formula for $g(t)$.

2. Explain that $E(t)$, as it is originally given, is the function that takes in the age of the beagle in years and puts out the energy needed by that beagle. What will you get if you take a number of days, and plug it in to $g(t)$, and then plug the result into $E(t)$ (as it is originally given)? Said another way, what does $E(g(t))$ represent? Answer in a sentence.

3. Calculate the formula for $E(g(t))$ by plugging your formula for $g(t)$ into $E(t)$ (as it is orignially given). Simplify it so that you can check that your answer is the function $E(t)$ as it is given in part (a).

B. Write the definite integral that you need to solve to answer part (b), and calculate it (using the power rule for finding antiderivatives and the Fundamental Theorem of Calculus).

III. Do problem #58 page 412.