MATH 1450 **Name:** _____

Activity 13

In lecture, we've now seen the Fundamental Theorem of Calculus and done some very basic examples. In this activity, we will try to stretch our understanding of what the Fundamental Theorem means in different contexts.

1. In the following problems, let $f(t) = F'(t)$. Write the integral $\int_a^b f(t)\,dt$ and compute it.

(a) $F(t) = 7 \cdot 4^t;\ a = 2,\ b = 3$

(b) $F(t) = \tan t;\ a = 0,\ b = \pi/4$

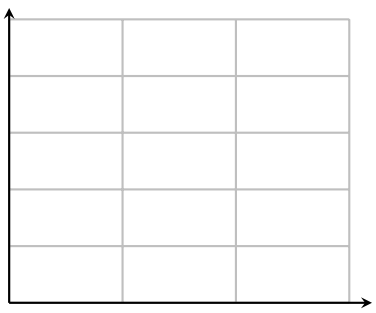
(c) $F(t) = \tan t;\ a = 0,\ b = \pi$

2. An old rowboat has sprung a leak. Water is flowing into the boat at a rate $r(t)$, given in the table below.

t (min)	0	5	10	15
$r(t)$ (L/min)	12	20	24	16

(a) Compute upper and lower estimates for the volume of water that has flowed into the boat during the 15 minutes.

(b) Draw a graph on the axes below to illustrate the *lower* estimate. Be sure to label the axes.



3. Assume that $0 \leq a \leq b$. Use geometry to construct a formula (in terms of a and b) for $\int_a^b x\,dx$. Then use this formula to compute $\int_2^5 x\,dx$ and $\int_3^8 x\,dx$. (Hint: Start by drawing a picture.)

4. A bungee jumper leaps off the starting platform at time $t = 0$ and rebounds once during the first 5 seconds. With velocity measured downward, for t in seconds and $0 \leq t \leq 5$, the jumper's velocity is approximated by $v(t) = -4t^2 + 16t$ meters/sec. Use a calculator or computer to compute any necessary integral(s) in this problem.

(a) How many meters does the jumper travel during the first five seconds?

(b) Where is the jumper relative to the starting position at the end of five seconds?