Math 129 - Section 017
Exercises on Numerical Approximation of Integrals

1. Suppose f is (strictly) increasing and concave down on $[a, b]$. List the following numbers in order from least to greatest: LEFT(n), RIGHT(n), MID(n), TRAP(n), $\int_a^b f(x)dx$.

   Answer: LEFT(n) < TRAP(n) < $\int_a^b f(x)dx$ < MID(n) < RIGHT(n).

2. Find f, a, b, and n such that f is nonconstant and $\int_a^b f(x)dx$=LEFT(n)=RIGHT(n). (Setting $a = b$ is cheating.)

   Hint: Choose $a = -1$, $b = 1$. Any odd function f such that $f(a) = f(b) = 0$ will work, provided you choose n correctly. (By the way, $f(x) = x^2$ will not work.)

3. Is it true that if $m > n$, then |ERR(TRAP(m))| < |ERR(TRAP(n))|? Explain or give a counterexample.

   Answer: False. You should try to come up with a counterexample.