Name:_____

Test 4
Spring 2008
MATH 121 Section 02
April 17, 2008

Directions : You have 50 minutes to complete all 5 problems on this exam. There are a possible 100 points to be earned. You may not use your book, notes, or any graphing/programmable calculator. Please be sure to show all pertinent work. *An incorrect answer with no work will receive no credit!* If any portion of the exam is unclear please come to me and I will elaborate provided I can do so without giving away the problem.

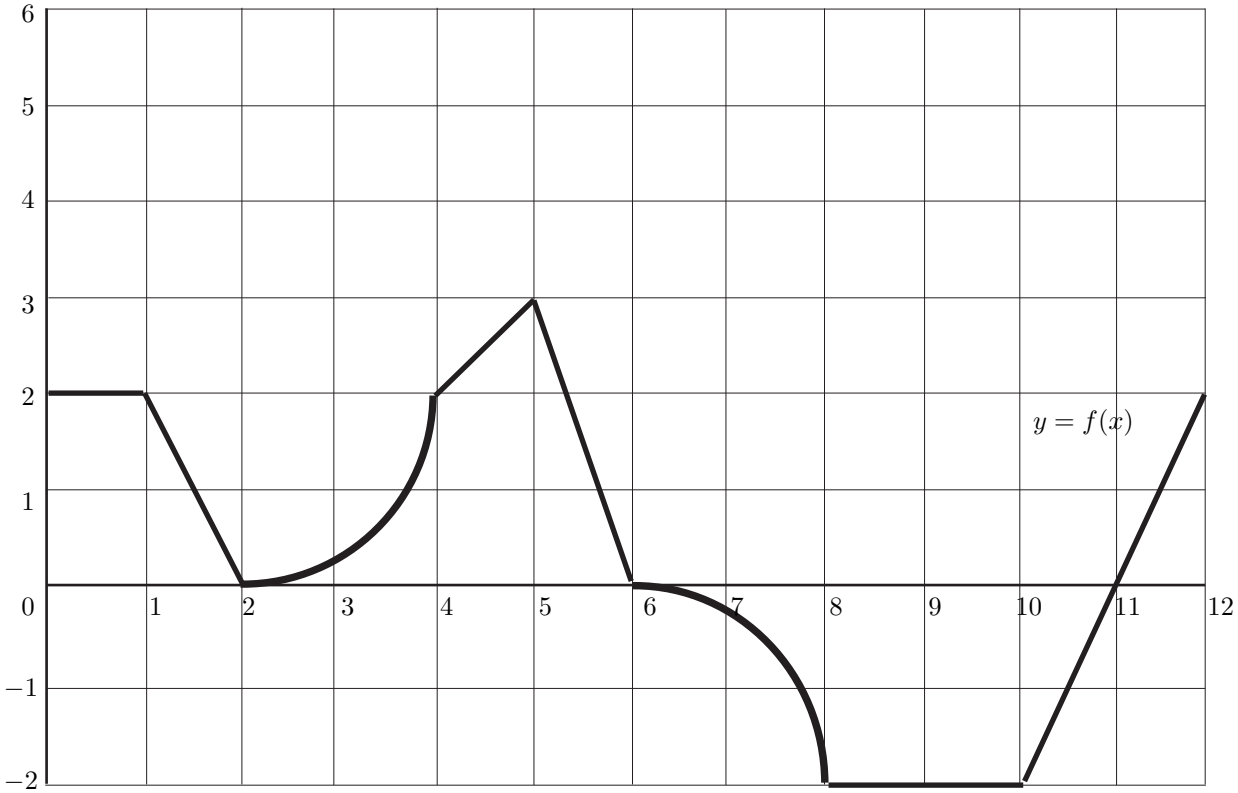
1. (20 points)
   Use the definition of an integral (i.e., the limit of a Riemann sum) to compute

$$\int_0^4 4x + 16\,dx.$$

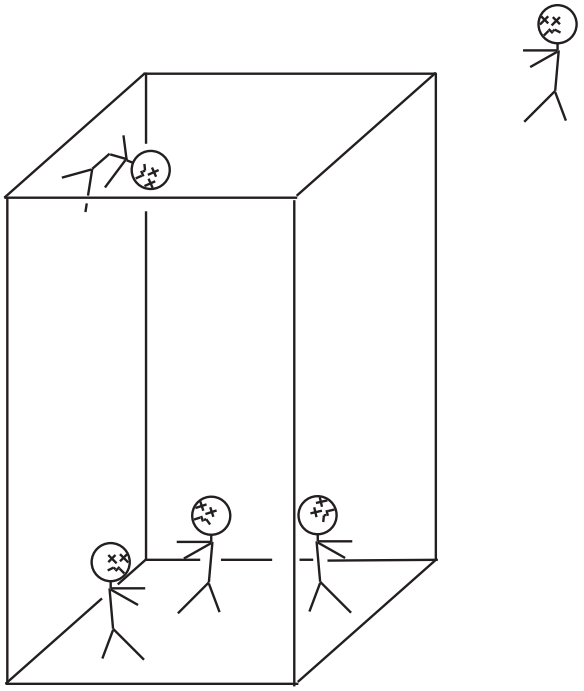
   You may *not* use the fundamental theorem of calculus as a solution to this problem.

2. (20 points)
Consider the graph of the function $f(x)$ given below. Evaluate

$$\int_1^{11} f(x)dx.$$



3. (20 points)
The Umbrella Corporation is interested in developing a Zombie Trap^{TM}. The trap is simply an open box that is buried in the ground. Wandering zombies stumble into the trap and cannot get out. No need for anything fancy, zombies are pretty stupid. Once the Zombie Trap^{TM} is full it is hoisted out of the ground and hauled away to the underground research facility. Given that the Zombie Trap^{TM} is an open box with a square base, what are the dimensions that minimize the amount of material required to build the box provided the volume is 32,000 cm^3?



4. (20 points)
Estimate the area under the graph of $f(x) = 1 + x^2$ from $x = -1$ to $x = 2$ using three rectangles and right endpoints.

5. (20 points)
Determine a region whose area is equal to the given limit. Do not evaluate the limit.

$$\lim_{n\to\infty} \sum_{i=1}^{n} \frac{5}{n} \sqrt{1 + \frac{5i}{n}}.$$