

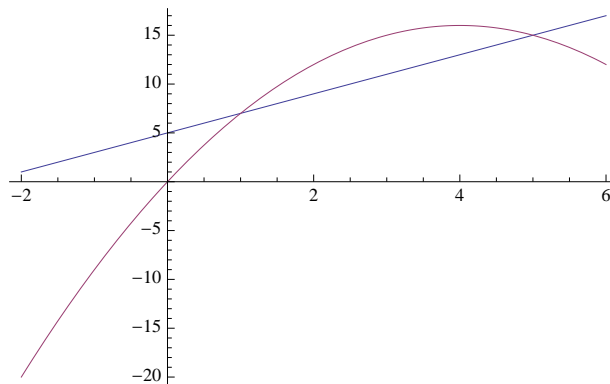
Name:

## Math 115 Exam 3

December 8th

**Directions:** WRITE YOUR NAME ON THIS QUIZ! Except where indicated, merely finding the answer to a problem is not enough to receive full credit; you must show how you arrived at that answer. DO NOT convert irrational numbers such as  $\sqrt{3}$  or  $\pi$  into decimal approximations; just leave them as they are.

1) Below are the graphs of the functions  $y = 2x + 5$  and  $y = -x^2 + 8x$ .



- (2 points) Shade the area between the curves from  $x = -1$  to  $x = 3$ .
- (5 points) Find all intersection points of the two curves when  $-1 \leq x \leq 3$ .
- (10 points) Compute the area between the curves from  $x = -1$  to  $x = 3$ .

2) Sasquatch has been captured by errant Bigfoot hunters. In order to contain him, they have built a Sasquatch pen in the shape of a rectangle with 20 foot tall walls. One side contains a door and costs \$14 per square foot. The other three sides are cheaper at \$10 per square foot. The hunters crudely estimate that a pen with an area of 14,520 square feet will keep Sasquatch pacified.

- a) (5 points) Draw a picture that reflects the above situation.
- b) (8 points) Establish an equation in one variable for the cost of Sasquatch's pen.
- c) (13 points) Find the cheapest amount of material that can be used for the pen. Be sure to show that your answer is correct.

**3)** Evaluate the following integrals.

a) (6 points)  $\int 3x^2 + 16x + 7 \, dx$

b) (10 points)  $\int_{\pi/4}^{\pi/3} \frac{\cos(x)}{\sin^2(x)} \, dx$

c) (13 points)  $\int_0^{\pi/4} \sqrt{1 - \tan(x)} \sec^4(x) \, dx$

4) From the previous exam, we know that it is possible for a sphere to have its volume equal to its radius plus two.

b) (10 points) Show that there can be only one such sphere.

c) (8 points) Starting with  $r_1 = 1$ , apply Newton's method to find  $r_3$ , thus approximating the radius of the sphere. You may leave your answer in unexpanded form.