

Your Name: \_\_\_\_\_

1. Show that the area of the region contained between the curves  $y = 4 - 2x^2$  and  $y = x^2 - 8$  is 32 square units.

2. A good model for the sale price of all unground beef in the United States  $t$  months after May, 2015, was

$$P(t) = 4.7 - 0.037t + 0.0004t^2$$

dollars per pound. What was the average price of unground beef during the 3-month period from July to October in 2015?

3. Consider the “Chotikapanich” model for a Lorenz curve, where

$$L(x) = \frac{1}{e^k - 1} (e^{kx} - 1),$$

where  $k$  is an (as yet) unknown constant.

(a) Check that, regardless of the value of  $k$ , for this formula we get  $L(0) = 0$  and  $L(1) = 1$ .

(b) Write one or two sentences explaining why it is important, in the context of distribution of income, that any Lorenz curve should satisfy the equations  $L(0) = 0$  and  $L(1) = 1$ .

(c) According to the Gini Index, which model shows greater income inequality for a country: a model with Lorenz curve given by the Chotikapanich model with  $k = 2.7$ , or by the Lorenz curve  $L(x) = \frac{3}{4}x^3 + \frac{1}{4}x$ ?

4. What lump sum is required to be invested now at 4% annual interest (compounded continuously) in order to match the future value of a continuous income stream of  $50 + 10t$  thousand dollars per year, at the same interest rate and over the next fifteen years? *Hint:* You may use the fact that  $\int t e^{kt} dt = \frac{e^{kt}}{k} (t - \frac{1}{k}) + C$  for any constant,  $k$ .