Math 205 Exam I

Tuesday June 13, 2006

Instructor:_____ **Class Time:**_____ **Name:**_____

No books or notes are allowed. Please read the problems carefully and do **all** you are asked to do. **You must show your work!** You can use the back page as a scratch paper. Do the problems at the space provided.

Total/100	#1	#2	#3	#4	#5	#6	#7	#8

1(total points: 12). Record shows that a company that produces radios has the total cost $C(q) = \$31,000$ if $q = 1000$ radios are produced, and it has the total cost $C(q) = \$80,000$ if $q = 8000$ radios are produced. Suppose that the cost function is linear.

(a)**(8 points).** Find a formula for the cost function.

(b) **(4 points).** Find the fixed costs and the variable cost per radio.

2 (total points: 12 points).

(a) **(7 points).** A \$25,000 robot depreciates linearly down to a value of zero in 20 years. Find a formula for its value as a function of time.

(b) **(5 points).** How much is the robot worth five years after its purchase?

3 (total points: 13). The demand and supply curves for a certain product are given in terms of price, p dollars per unit, by

$$D(p) = 100 - 2p \text{ and } S(p) = 3p - 50.$$

(a) **(5 points).** Find the equilibrium price and quantity.

(b) **(5 points).** If a specic tax of \$6 per unit is imposed on the producers, find the new equilibrium price and quantity.

(c)**(4 points).** Predict the total tax revenue of the government due to the trading of the product.

4 (total points: 12). In each of the items (a)-(d), determine if the function is a power function. If it is a power function, write it in the form $y = kx^p$ and give the values of the coeffcient k and the exponent p.

(a)**(3 points).** $y = -\frac{1}{2x+1}$

(b) **(3 points).** $y = e^{\ln x^2}$

(c) **(3 points).** $y = \dfrac{5}{\sqrt[5]{x}}$

(d) **(3 points).** $y = x(2x^2)^3$

5 (total points: 13). A cup of coffee contains 100 mg of caffeine which leaves the body at a continuous rate of 16% per hour.

(a) **(6 points).** Write a formula for the quantity, Q mg, of caffeine in the body t hours after drinking a cup of coffee.

(b) **(7 points).** Use logarithms to find the half-life of the caffeine.

6 (total points: 12). The following table gives partial data of a function $f(x)$.

x	-2	-1	0	1	2
f(x)	16	24	36	54	81

(a) **(6 points).** Could the function $f(x)$ be linear or exponential.

(b) **(6 points).** Find a formular for the function.

7 (total points: 12). Assume that Bank A offers a savings account that compounds interest semi-annually (twice per year), and Bank B offers one that compounds continuously. Assume that both accounts have the same 6% effective annual yield.

(a) **(7 points).** Find the annual interest rate (nominal rate) of the account of Bank B.

(b) **(5 points).** Without further computation, determine which account will have higher balance in 20 years if each is opened right now with $5,000 initial deposit.

8 (total points: 13). You invest \$10,000 in an account which pays interest compounded continuously.

(a) **(6 points).** How much money is in the account after 8 years, if the annual interest is 4%?

(b) **(7 points).** If you want the account to contain \$18,000 after 8 years, what yearly interest rate is needed?