Review for Final Exam

Here are some practice problems for the final exam. You should also go over your homework problems, previous study guides and problems from class.

1. Eva wants to invest \$5000 in a fund. Fund A offers 4.2% compounded monthly. Fund B offers 4.0% compounded continuosly.

(A) How much money will be in the fund after 8 years if she chooses fund A

(B) How much money will be in the fund after 8 years if she chooses fund B

(C) Calculate the effective rate in each case.

2. (A) If \$3000 is deposited in an account and the amount of money after 10 years is \$5500 compounded continuously. What is the interest rate?

(B) Luis wants to have $\$20,000$ in 8 years for a down payment on a new house. How much should he deposit today at 5% compounded quartely, to have that amount in 8 years?

3. If money is flowing continuously at a constant rate of \$500 per year over 10 years at 8% interest compounded continuosly, find the following.

(A) The total money flow over the 10 year period.

(B) The accumulated amount of money flow, compounded continuously, at time $T = 10$

(C) The present value of the amount with interest.

4. Suppose the demand function for sugar is a linear function, $p = D(q)$, where p is the price in dollars and q is the quantity in thousands of pounds. When the price is \$1.2 per pounds the quantity demanded is 1 thousand pound and when the price is \$2.2 per pounds the quantity demanded is 500 pounds.

(A) Find an equation for $D(q)$

(B) If the Supply function for sugar is

$$p = S(q) = 1.4q - 0.6,$$

find the equilibrium quantity and the equilibrium price.

5. Find the limit

(A) $\lim_{x \to 5} \dfrac{2x(x-5)}{x^2-25}$

(B) $\lim_{x \to 4} \dfrac{\sqrt{x}-2}{x^2-x-12}$

6. Find the asymptotes of $f(x) = \frac{3x^2+1}{x^2-5x+6}$

7. If a CD manufacturer charges $p(x)$ dollars per CD, where $p(x) = 12 - \frac{x}{8}$, then x thousand CDs will be sold.

(A) Find an expression for the total revenue from the sale of x thousand CDs.

(B) Find the value of x that leads to maximum revenue.

(C) Find the maximum revenue.

8. The total profit from selling x books is

$$P(x) = \frac{5x - 6}{2x + 3}.$$

(A) Find the average profit function.

(B) Find the marginal average profit function.

(C) Find the maximum average profit.

9. A small company manufactures and sells bicycles. The production manager has determined that the cost and demand functions for q ($q \geq 0$) bicycles per week are

$$C(q) = 10 + 5q + \frac{1}{60}q^3$$

and $p = D(q) = 90 - q$, where p is the price per bicycle

(A) Find the maximum weekly revenue.

(B) Find the maximum weekly profit

(C) Determine the interval(s) in which the profit is increasing and/or decreasing.

10. A local club is arranging a charter flight to Hawaii. The cost of the trip is \$1600 each for 90 passengers, with a refund of \$10 per passanger for each passenger in excess of 90.

(A) Find the number of passengers that will produce the maximum revenue received from the flight.

(B) What is the maximum revenue?

11. Suppose 100,000 lamps are to be manufactured annually. It costs \$1 to store a lamp for 1 year, and it costs \$500 to set up the factory to produce a batch of lamps. Find the number of lamps to produce in each batch. Find the number of batches of lamps that should be manufactured annually.

12. A bookstore has an annual demand for 100,000 copies of a best-selling book. It costs \$0.50 to store 1 copy for 1 year, and it costs \$60 to place an order. Find the optimum number of copies per order.

13. For the demand function $q = 100 - \frac{p}{4}$.

(A) Find the elasticity of demand.

(B) Is the demand elastic, inelastic or does it have unit elasticity when $p = 2$?

(C) Find the value of q at which total revenue is maximized.

14. Find the area between the curves $y = 2e^{2x}$, $y = e^{2x} + 1$, $x = -1$ and $x = 2$.

15. Suppose that the total profit in hundreds of dollars from selling x items is given by

$$P(x) = 2x^2 - 5x + 6.$$

(A) Find the average rate of change of profit for the following changes in x: 2 to 4.

(B) Find the marginal profit at $x = 4$.

(C) Find the equation of the tangent line to the graph of P at $x = 4$.

16. Find the derivative of the following functions:

(A) $f(x) = \dfrac{xe^{2x} + 1}{(4x^3 - x)^2}$

(B) $f(x) = \sqrt{x^4 - 2}$

(C) $h(x) = \ln(x^3 + 4)$

17. Find the following indefinite integral

$$\int \frac{x}{(x^2-1)^3}\,dx$$

18. Find the following definite integral

$$\int_0^2 4x^2\sqrt{x^3+1}\,dx$$

19. Find the cost function for the marginal cost function $C'(x) = 0.2x^2 + 5x$, when fixed cost is \$10.

20. Problem 3.5 7 from the textbook

21. Suppose a manufacturer's cost, $C(q)$, of producing q items of a product is a linear function of q. The fixed cost of producing an item is \$10 and the marginal cost is \$3. They sell the product for \$5 per item.

(A) Find a formula for $C(q)$

(B) Find a formula for the revenue, $R(q)$.

(C) What is the profit when 80 items are produced.

22. Suppose that the supply function for honey is

$$p = S(q) = 0.3q + 2.7,$$

where p is the price in dollars for an 8-oz container and q is the quantity in barrels. Suppose also that the equilibrium price is \$4.50, and the demand is 2 barrels when the price is \$6.10. Find an equation for the demand function $p = D(q)$, assuming it is linear.

23. The manager of a restaurant found that the cost to produce 100 cups of coffee is \$11.02, while the cost to produce 400 cups is \$40.12. Assume the cost $C(x)$ is a linear function of x, the number of cups produced.

(A) Find a formula for $C(x)$.

(B) What is the fixed cost?

(C) Find the total cost of producing 1000 cups.

24. Find the consumers' surplus if the demand function for olive oil is given by

$$D(q) = \frac{32000}{(2q+8)^3}$$

and the equilibrium quantity is $q = 6$.

25. Solve the equation

$$20^{2x-1} = 3^{x+3}$$