

Chapter 5, 6.1, 6.2, and 11.1, 11.2

Directions: Observe the Emory College Honor Code while taking the test. Be sure to **label** all appropriate answers. Show work to support your answers, and cross out or erase any incorrect work. If you use your calculator to do something, tell us what you did.

1. For each statement circle **T** for True or **F** for False. If the answer is false, correct it without using the word not.

(a) If you use a left-hand sum with  $n = 2$  to approximate the area under  $f(x) = 2^x$ , your answer will be an overestimate.

**T**    **F**

(b) The rate of visitor spending, in billions of dollars per year, in Hawaii during the years 1985 to 1993 can be approximated by the function  $h(t)$ , where  $t = 0$  represents June 30, 1985. The value of  $\int_0^5 h'(t)dt$  is the total amount of visitor spending between June 30, 1985 and June 30, 1990.

**T**    **F**

(c) If the rate of change of a function  $f(x)$  is negative on the interval  $[a, b]$ , then the total change of  $f(x)$  is negative on  $[a, b]$ .

**T**    **F**

(d) Given a marginal cost function,  $C'(q)$ , we would expect that costs would increase by the amount  $\int_a^b C'(q)dq$  as  $q$  increases from  $q = a$  to  $q = b$ .

**T**    **F**

(e) If a product is sold at the equilibrium price, then consumer surplus is bigger than producer surplus.

**T**    **F**

2. Over the period 1988-1998, doctors were writing prescriptions for Prozac at the rate of approximately  $-0.015t^2 + t + 1.9$  million new prescriptions per year ( $t$  is measured in years:  $t = 0$  represents June 1988). Find the number of new prescriptions for Prozac written from June 1990 to June 1995.

3. Twenty semi-annual payments of \$4000 each, with the first payment now, are to be made from an account earning 10%, compounded semi-annually. How much must be deposited now to cover the payments?

4. The marginal cost function of producing  $q$  mountain bikes is  $C'(q) = \frac{600}{0.35q+5}$ .

a. If the fixed cost in producing the bicycles is \$2000, find the total cost to produce 30 bicycles.

b. If the bikes are sold for \$200 each, what is the profit (or loss) on the first 30 bicycles?

c. Find the marginal profit on the 31st bike.

5. The manager of the Tele-Star Cable Television Service estimates that the total number of subscribers to the service in a certain city  $t$  years from now will be  $N(t) = -\frac{40000}{\sqrt{1+0.2t}} + 50000$ .

a. Find the total number of cable television subscribers in 2 years.

b. Find the average number of cable television subscribers over the next 5 years.

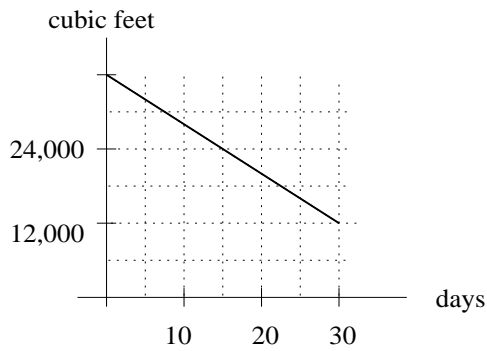
6. The demand curve for a product is given by  $p = F(q) = 30e^{-.0012q}$  and supply curve is given by  $p = g(q) = 0.03q + 1$  for  $0 \leq q \leq 1000$ , where  $q$  is quantity and  $p$  is price in \$/unit.

a. Find the equilibrium price and equilibrium quantity.

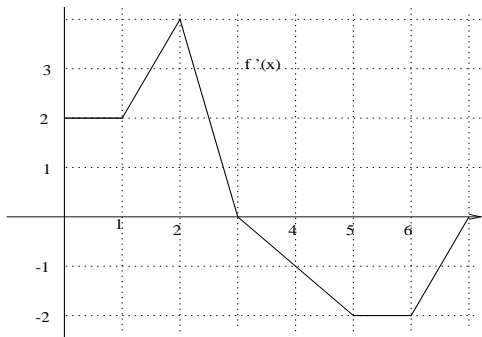
b. Calculate and \*interpret\* the consumer surplus at equilibrium.

7. As a result of new legislation, preliminary data indicate that the number of alcohol-related traffic accidents has been changing at the rate of  $R(t) = -10 - te^{-0.3t}$  accidents per month,  $t$  months since the new laws were put into effect. There were 982 alcohol-related accidents the year before the enactment of the laws. Determine how many alcohol-related accidents were expected during the first year the laws were in effect.

8. A warehouse charges its customers \$4 per day for every 10 cubic feet of space used for storage. The figure below records the storage used by one company over a month. How much will the company have to pay?



9. The figure below is  $f'(x)$ . Given that  $f(0) = 2$ ,
- find  $f(4)$ .
  - find  $\int_1^6 f'(x)dx$ .



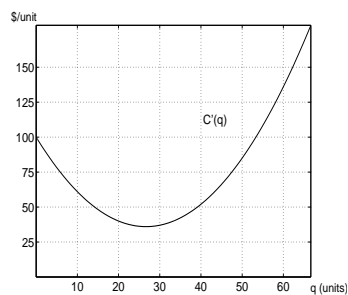
10. Supply and demand data are given in the tables below.
- Which table shows supply and which shows demand?
  - Estimate the equilibrium price and quantity.
  - Estimate (without using regression) the producer surplus and interpret it.

Table 1							
$q$ (quantity)	0	100	200	300	400	500	600
$p$ (\$/unit)	60	50	41	32	26	20	17

Table 2							
$q$ (quantity)	0	100	200	300	400	500	600
$p$ (\$/unit)	10	13	21	32	42	45	49

11. Annual sales of fountain pens in Littleville are presently 4000 per year and are increasing by 10% per year. How many fountain pens will be sold over the next 5 years?

12. The graph below shows the marginal costs of production for a certain product.



- (a) The company typically operates at a production level of 40 units. Roughly how much will it cost the company to step up production by 10 units?
- (b) If the total cost of producing 50 units ends up being \$7,000, what were the fixed costs for the product?