10:01
10:12

Test 3
Dusty Wilson
Math 111 – Fall 2009

Name: key.

Television is something the Russians invented to destroy American education.

Paul Erdös (1913 - 1996)
Hungarian mathematician

No work = no credit

Closed Book & Closed Notes

Warm-ups (1 pt each) $7\times 8 =$ 56 $\frac{7}{0} =$ undefined $-7^2 =$ -49

1.) (5 pts) Suppose a computer manufacturer has the total cost function $C(x) = 85x + 3300$ and the total revenue function $R(x) = 385x$.

a. What is the equation of the profit function for this commodity?

$$P(x) = R(x) - C(x)$$
$$= 385x - (85x + 3300)$$
$$= 300x - 3300$$

b. What is the profit on 351 items?

$$P(351) = 102000$$

c. How many items must be sold to avoid losing money?

solve $P(x) = 0$

$\Rightarrow 0 = 300x - 3300$

$\Rightarrow 3300 = 300x \Rightarrow x = 11$

11 items.

d. What is the marginal profit?

$\overline{MP} = 300.$

e. Interpret the marginal profit.

profit increases \$300 for each additional unit sold.

2.) (4 pts) Suppose that the total cost function for a stereo is linear, that the marginal cost is \$27, and that the total cost for 50 stereos is \$4250. Write the equation of this cost function.

$C(x) = 27x + b$ ← fixed costs.

$C(50) = 4250 = 27x + b$ ← 50

$\Rightarrow 4250 - 27(50) = b$

$\Rightarrow b = 2900$

$C(x) = 27x + 2900.$

3.) (4 pts) If the supply function for a commodity is S: $p = q^2 + 8q + 20$ and the demand function is D: $p = 100 - 4q - q^2$, find the equilibrium quantity and equilibrium price.

$q^2 + 8q + 20 = 100 - 4q - q^2$

$\Rightarrow 2q^2 + 12q - 80 = 0$

$\Rightarrow q^2 + 6q - 40 = 0$

$\Rightarrow (q+10)(q-4) = 0$

$\Rightarrow \cancel{q = -10}$ or $q = 4$

$\Rightarrow q = 4$ & $p = 4^2 + 8 \cdot 4 + 20 = 68$

price = \$66

quantity = 4.

4.) (4 pts) If the total costs are $C(x) = 1600 + 1500x$ and total revenues are $R(x) = 1600x - x^2$, find the break-even points.

$C = R$

$\Rightarrow 1600 + 1500x = 1600x - x^2$

$\Rightarrow x^2 - 100x + 1600 = 0$

$\Rightarrow (x - 80)(x - 20) = 0$

$\Rightarrow x = 80$ or $x = 20.$

equilibrium when 20 or 80 items made/sold.

5.) (4 pts) If, in a monopoly market, the demand for a product is $p = 1600 - x$ and the revenue is $R = p \cdot x$, where x is the number of units sold, what price will maximize revenue?

$R = p \cdot x$

$= (1600 - x) \cdot x$

max @ $x = 800$

w/price \$800.

6.) (4 pts) The profit function for a firm making widgets is $P(x) = 88x - x^2 - 1200$. Find the number of units at which maximum profit is achieved, and find the maximum profit.

max $P(x) = -x^2 + 88x - 1200$

vertex @ $\left(\frac{-b}{2a}, P\left(\frac{-b}{2a}\right)\right)$

$x = \frac{-b}{2a} = \frac{-88}{2(-1)} = 44$

$P(44) = \$736$

max profit of \$736 when 44 units are made/sold.

7.) (2 pts) Find the infinite sum, S_∞, of this geometric sequence: 81, 27, 9, 3, …

$$S_\infty = \frac{81}{1-1/3} = \frac{81}{2/3} = \frac{243}{2}$$

8.) (2 pts) Find the twenty-fourth term, a_{24}, and the sum, S_{24}, of the first 24 terms of the following arithmetic sequence: 3, 7, 11, 15, 19, …

$$a_{24} = 3 + 4(n-1)\Big|_{n=24}$$

$$= 3 + 4(23)$$

$$= 95$$

$$S_{24} = \frac{24}{2}(3 + 95)$$

$$= 1176$$

9.) (2 pts) Write an expression for the sum, S_{240}, of the first two hundred forty terms of the geometric sequence: 2, 8, 32, 128, …

$$S_{240} = \frac{2(1-4^{240})}{1-4}$$