MATH 1330/1430 Final Exam Spring 2011

Directions: Answer each question completely. Show all work in the blue book to receive full credit. Complete one problem per page and list all problems in order. Label all answers with appropriate "units" and circle your final answer. Round all monetary answers to the nearest cent and express probabilities as fractions or as decimals correct to four places.

1. In 2005, a manufacturer installed a new machine in their factory at a cost of $250,000. The machine is depreciated linearly over 10 years with a scrap value of $10,000.

   (A) Find an expression for the machine's value t years after 2005.

   (B) What is the value of the machine in 2009?

2. A DVD manufacturer is producing an instructional DVD. It will cost $84,000 to record the DVD and $15 to produce and distribute each DVD. The manufacturer plans on selling then DVDs for $50 each.

   (A) What is the cost function $C(x)$ for producing x units?

   (B) What is the revenue fucntion $R(x)$ for selling x units?

   (C) What is the profit function $P(x)$ for producing and selling x units?

   (D) Find the break-even point.

3. The estimated monthly profit realizable by a camera manufacturer for producing and selling x units is $P(x) = -0.04x^2 + 240x - 10,000$ dollars.

   (A) How many cameras should be produced each month in order to maximize profit?

   (B) What is the maximum monthly profit?

4. The weekly supply and demand functions for Char-Master grills, are $p = s(x) = -x^2 - 5x + 78$ and $p = d(x) = 3x + 30$ respectively where x represents the quantity demanded in units of a thousand and p the unit price in dollars. Find the equilibrium quantity and equilibrium price.

5. Find the accumulated amount at the end of 8 months on a $1200 bank deposit paying simple interest at a rate of 7% per year.

6. A young man is the beneficiary of a trust fund established for him 18 years ago at his birth. If the original amount placed in trust was $40,000, how much will he receive if the money has earned interest at the rate of 7% per year compounded quarterly?

7. How long will it take an investment of $2000 to double if the investment earns interest at the rate of 7% compounded continuously? (Round your answer to two decimal places.)

8. Fleet Street Savings Bank pays interest at the rate of 4.25% per year compounded weekly in a savings account. Liberty Bank pays interest at the rate of 4.15% per year compounded daily (assume a 365 day year). Which bank offers the better rate of interest?

9. Andrea wishes to accumulate a retirement fund of $250,000. How much should she deposit each month into her retirement account, which pays interest at the rate of 8.5% per year compounded monthly, to reach her goal upon retirement 25 years from now?

10. The Taylors have purchased a $320,000 house. They made an initial down payment of $10,000 and secured a mortgage with interest charged at the rate of 6% per year on the unpaid balance. Interest computations are made at the end of each month.

    (A) If the loan is to be amortized over 30 yr, what monthly payment will the Taylor's be required to make?

    (B) What is their equity after 10 yr?

11. A survey of 100 college students who frequent the reading lounge at a university revealed that 40 read Time, 30 read Newsweek, 25 read Rolling Stone, 15 read Time and Newsweek, 12 read Time and Rolling Stone, 10 read Newsweek and Rolling Stone, and 4 read all three magazines.

   (A) Draw a Venn diagram representing this data.

   (B) How many students surveyed read at least one of these magazines?

   (C) How many students surveyed read only one of these magazines?

   (D) How many students surveyed read none of these magazines?

12. A company has five vacancies in its exectutive training program. In how many ways can the company select five trainees from a group of ten female and ten male applicants if the vacancies

   (A) can be filled by any combination of men and women?

   (B) must be filled by three men and two women?

13. A shelf in a department store contains 85 colored ink cartridges for a popular ink-jet printer. Five of these cartridges are defective. If a customer selects 3 of these cartridges at random, what is the probability that

   (A) exactly one is defective?

   (B) at least one is defective?

14. A manufacturer obtains parts from three firms: A, B, and C. Firms A, B, and C supply 40%, 35%, and 25% of the parts used by the manufacturer. The quality control department of the company has determined that 1% of the parts produced by firm A are defective, 2% of the parts produced by firm B are defective, and 1.5% of the parts produced by firm C are defective.

   (A) Draw a probability tree representing this data.

   (B) What is the probability that a randomly selected part is defective?

   (C) If a part is found to be defective, what is the probability that it was produced by firm B?

15. An oil company is considering drilling at two sites. It is estimated that site A will net \$7 million if successful (probability 0.75) and lose \$3 million if not successful. Site B will net \$10 million if successful (probability 0.65) and lose \$4 million if not successful. Find the expected return from sites A and B and determine where the company should drill.

16. A video rental company has two locations in a certain city. Is is expected that each week, if a video is rented from store A the probability it will be returned to location A is 70% and the probability it will be returned to location B is 30%. Similarly, if a video is rented from location B the probability it will be returned to location B is 80% and the probability it will be returned to location A is 20%. Currently, the company has 1000 videos at each location.

   (A) Find the transition matrix for this Markov chain.

   (B) Find the number of videos the rental company has at each location 2 weeks from now.

   (C) What percentage of the videos will the rental company have in location A in the long run if the transition probabilities do not change?