

MATH 1330/1430

Circle Section:      8:00 section 02  
                                 10:00 section 10  
                                 11:00 section 04  
                                 12:00/12:30 section 05

This exam contains 16 problems. Check to make sure you have all 16 problems. Enter all the requested information at the top of this page **and** on the first page of the exam.

You may use any TI83 or TI84 series calculator. You may not use a TI 89, TIInspire, TIInspire with an 84 faceplate or Casio/HP equivalents, your cell phone or anything capable of storing information or connecting with the internet. All cell phones/iPads/head phones/etc. must be off and out of sight during the exam.

You may not leave the testing room during the exam.

In this class, no books, notes or notecards are allowed on the exam.

You must show how to set up the problem for solving. Then you can choose to work it out by hand or use your calculator. Problems with no work will not receive full credit.

All work should be done in a blue book that has been approved by your instructor in advance.

Work each problem on a separate page in the blue book. If you run out of room, you may request an additional blue book. You may write on the backside of the pages in the blue book.

You must work this exam using pencil only. Highlighters are allowed if desired. Be sure to box your FINAL answers clearly.

Round all monetary values to the nearest cent. Round all other decimal values to 4 decimal places in your final answer.

When you are finished, put the exam inside of your blue book and turn them in before you leave. You may NOT take the exam with you when you leave.

- (8 pts) 1. A manufacturer sells belts for \$12 per unit. The fixed costs are \$1600 per month, and the variable cost per unit is \$8.
- (a) What is the revenue function
  - (b) What is the cost function
  - (c) What is the profit function
  - (d) What is the number of belts the manufacturer must produce and sell each month for the manufacturer to break even? What is the amount of money at which there is neither a profit nor a loss in the manufacture of belts?
- (6 pts) 2. If the demand for a special edition Texas Tech shirt is  $d(x) = -2x + 320$  and the supply function is  $s(x) = 8x + 2$ , then what is the market equilibrium point?
- (6 pts) 3. The marketing research department for a company that manufactures and sells tablets established the followed profit function, where  $x$  is the number of tablets and  $P(x)$  is the profit, in dollars.
- $$P(x) = -4x^2 + 400x - 3600$$
- (a) How many tablets should be sold to retailers to maximize the daily profit?
  - (b) What is the maximum daily profit realizable?
- (6 pts) 4. Sodium 24 has a half-life of 15 hours. If 500 grams of this substance are present initially, find the amount present after  $t$  hours. What amount will be left after 80 hours? (Round to five decimal places.)
- (6 pts) 5. **Eight years ago**, Kim secured a bank loan of \$180000 to help finance the purchase of a house. The mortgage was for a term of 30 years with an interest rate of 5.5% per year compounded monthly on the unpaid balance to be amortized through monthly payments.
- a. What is the monthly payment?
  - b. What is the outstanding principal on Kim's house now?

- (6 pts) 6. If Dan deposits money into an account that earns 5.5% per year compounded continuously, how long will it take for his investment to be doubled? (Round your answer to one decimal place.)
- (6 pts) 7. Keri recently started making monthly contributions to a retirement fund that earns 6% compounded monthly. If Keri retires in 30 years, find what her monthly contributions should be for her to be able to withdraw \$2000 per month for 20 years after retirement.
- Here are the steps:
- First, you need to find out the amount she will need to have in the account to be able to withdraw \$2000 monthly for 20 years.
  - Next, you need to find how much she should contribute to the account monthly to make sure the account has the amount needed in 30 years.
- (6 pts) 8. At a Lubbock Public Library exhibition of new books, 3 young adult books, 4 science fiction books, and 5 mystery books will be displayed on a shelf. (Assume that none of the books are alike).
- In how many ways can the 12 books be arranged on the shelf?
  - In how many ways can the 12 books be arranged on the shelf if books in the same genre are placed together?
- (6 pts) 9. The price of a new car is \$16000. Assume that an individual makes a down payment of 25% toward the purchase of the car and secures financing for the balance at the rate of 10% per year compounded monthly.
- What monthly payment will they be required to make if the car is financed over a period of 36 months?
  - How much interest will they pay?
- (6 pts) 10. From a shipment of 60 Texas Tech caps, 5 of which are defective, a sample of 4 caps is selected at random.
- In how many ways can 4 caps be chosen from this sample?
  - How many samples contain 3 defective caps?
  - How many samples do not contain any defective caps?

- (4 pts) 11. An experiment consists of casting a pair of dice and observing the number that falls uppermost on each die. We may represent each outcome of the experiment by an ordered pair of numbers, the first representing the number that appears uppermost on the first die and the second representing the number that appears uppermost on the second die. Consider the sample space

(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)
(2,1)	(2,2)	(2,3)	(2,4)	(2,5)	(2,6)
(3,1)	(3,2)	(3,3)	(3,4)	(3,5)	(3,6)
(4,1)	(4,2)	(4,3)	(4,4)	(4,5)	(4,6)
(5,1)	(5,2)	(5,3)	(5,4)	(5,5)	(5,6)
(6,1)	(6,2)	(6,3)	(6,4)	(6,5)	(6,6)

Determine the probability that the sum of the numbers falling uppermost is greater than or equal to 6. (Round your answer to three decimal places.)

- (8 pts) 12. A manufacturer obtains GPS's from three different subcontractors: 20% from A, 40% from B, 40% from C. The defective rates from A are 1%, 3% for B and 2% for C.

- Draw and label a tree diagram neatly.
- If a defective GPS is returned, what is the probability that it came from: subcontractor B? (Round your answer to three decimal places.)
- What is the probability that a GPS comes from subcontractor A and it is not defective? (Round your answer to three decimal places.)
- Find  $P(D|B)$ .

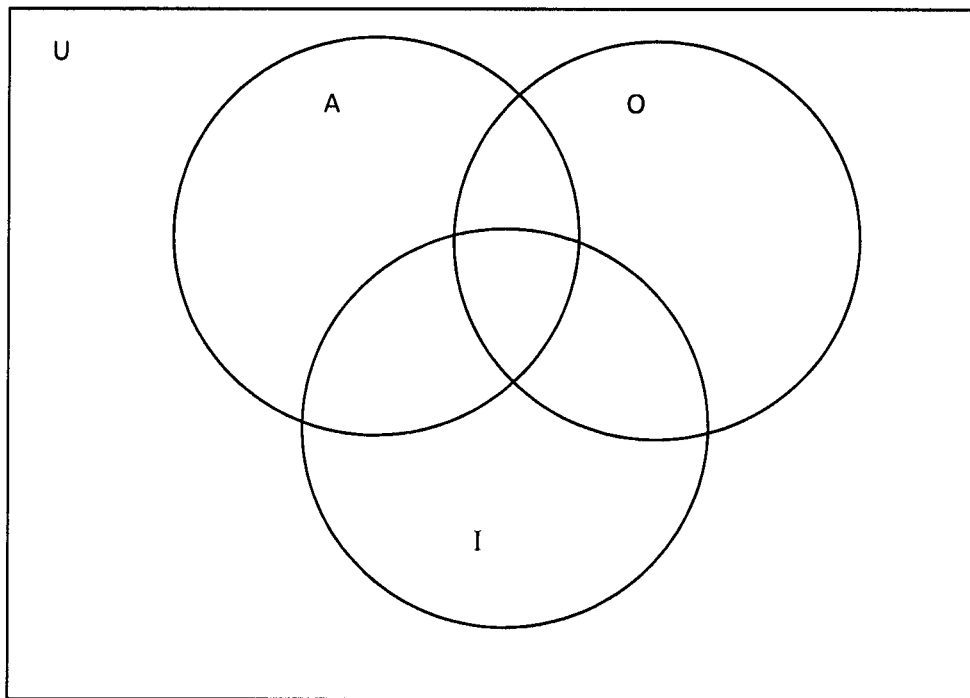
- (6 pts) 13. Two light bulbs are selected at random from a lot of 24, of which 4 are defective. What is the probability that at least 1 of the light bulbs is defective? (Round your answer to four decimal places.)

- (6 pts) 14. Given events  $A$  and  $B$ ,  $P(A) = 0.3$ ,  $P(B) = 0.8$ , and  $P(A \cup B) = .86$ , find:

- $P(A \cap B)$ .
- Determine if  $A$  and  $B$  are independent events.

(8 pts) 15. A survey was conducted of 300 college students about whether or not they like the bands Awolnation (A), OneRepublic (O), and Imagine Dragons (I). Here are the results:

105 students liked Awolnation  
176 students liked OneRepublic  
162 students liked Imagine Dragons  
65 students liked Awolnation and OneRepublic  
72 students liked Imagine Dragons and OneRepublic  
80 students liked Awolnation and Imagine Dragons  
50 students liked all three bands



How many students liked:

- a. at least two of the bands
- b. exactly one band
- c. only Imagine Dragons and OneRepublic
- d. none of the bands

(6pts) 16. Harry and Lloyd own a store that sells worm farms. After examining their monthly profit since beginning the business, they created the following table given in part a.

- a. Find the probability distribution of the random variable  $X$ , where  $X$  denotes the profit for the month. (Round your answers to two decimal places.)

$x$ (\$)	-325,000	-100,000	0	125,000	185,000	1,200,000
<i>Frequency</i>	2	1	2	7	3	5
$P(X = x)$						

- b. If the random variable  $X$  represents the profit for the month, what can Harry and Lloyd expect as profit next month?

# Finance Formulas

$$A = P(1 + rt) \quad \text{Simple Interest}$$

$$A = P(1 + i)^n \quad \text{Compound Interest}$$

$$A = Pe^{rt} \quad \text{Compound Continuously}$$

$$r_{eff} = \left(1 + \frac{r}{m}\right)^m - 1 \quad \text{Effective Rate, Compound}$$

$$r_{eff} = e^r - 1, \quad \text{Effective Rate, Continuous}$$

$$S = R \left[ \frac{(1+i)^n - 1}{i} \right] \quad \text{Future Value}$$

$$P = R \left[ \frac{1 - (1+i)^{-n}}{i} \right] \quad \text{Present Value}$$

$$i = \frac{r}{m}$$

$$n = mt$$