

MATH 1330 Final Exam B, Spring 2015, Print Name: _____

This exam contains 17 problems. Check to make sure you have all 17 problems. Enter your name at the top of this page **and** on all odd-number pages of the exam.

This test has a total of 100% that can be earned.

Formula sheet is included in the second page.

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.

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

You must show all work to get full credit. Be sure to box your final answers.

Exam Rules:

1. All cell phones must be turned OFF or on silent.
2. Hats must be taken off or turned backward.
3. All papers/notes/books should be closed and out of site.
4. There is no leaving during the exam. Once you leave the room, you are done with the exam.
5. No sharing calculators during the exam.
6. Eyes on your own paper!!

Finance Formulas

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

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

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

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

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

$$\frac{70}{r\%} \quad \text{Rule of 70}$$

$$\frac{72}{r\%} \quad \text{Rule of 72}$$

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

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

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

$$i = \frac{r}{m} \qquad n = mt$$

1. (5%) A company has a monthly fixed cost of \$8,000 and production cost of \$5 for each unit produced. The product sells for \$12/unit.

(a) What is the company's cost function?

(b) What is the company's revenue function?

(c) What is the company's profit function?

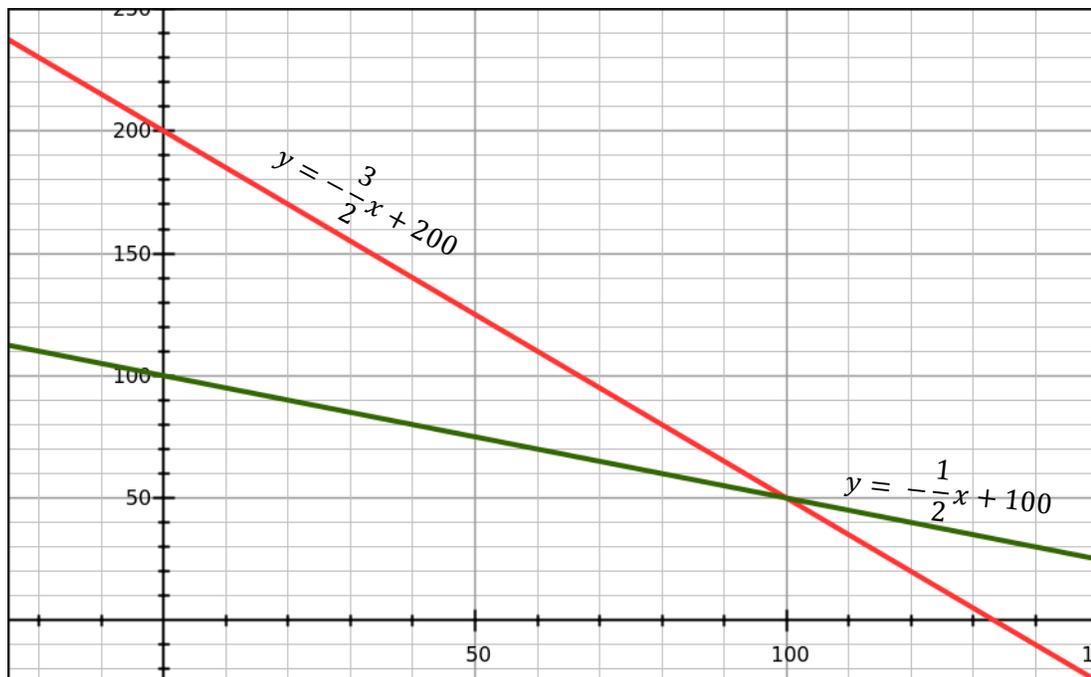
(d) What is the break-even point for the company?

2. (15%) Michigan Polar Products makes downhill and cross country skis. A pair of downhill skis requires 4 man-hours for cutting, 3 man-hour for shaping and 2 man-hours for finishing while a pair of cross country skis requires 4 man-hours for cutting, 2 man-hours for shaping and 4 man-hour for finishing. Each day the company has available 560 man-hours for cutting, 400 man-hours for shaping and 400 man-hours for finishing. How many pairs of each type of ski should the company manufacture each day in order to maximize profit if a pair of downhill skis yields a profit of \$50 and a pair of cross country skis yields a profit of \$40? Answer parts (a) – (d).

(a) Complete the blank cells in the table with all appropriate data.

	Downhill Skis (x)	Cross Country Skis (y)	Totals
Cutting hours			≤ 560
Shaping hours	3		
Finishing hours		4	
Profit			z

(b) Finish graphing the feasible region. Find and label all remaining lines of the feasible region. Find and label all remaining corner points and shade the feasible region.



(c) Complete the Corner Point table.

Corner Points	Objective Function:
(0, 0)	0
(0, 100)	4000
(133, 0)	6650

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(d) How many pairs of each type of ski should the company manufacture each day in order to maximize profit?

(e) What is the maximum profit?

3. (15%) The Texas Tech Forge produces and ships three different Double T plaques: a bronze plaque, a nickel plaque, and a pewter plaque. Each bronze plaque requires \$10 in materials, 4 hours of labor, and \$7 to ship. Each nickel plaque requires \$15 in materials, 4 hours of labor, and \$3 to ship. Each pewter plaque requires \$6 in materials, 5 hours of labor, and \$6 to deliver. The profit on the bronze plaque is \$13, on the nickel plaque is \$17, and on the pewter plaque is \$7. The company has available up to 2200 hours of labor per week. Each week, they can spend at most \$1200 on materials and \$1000 on shipping. How many of each type of plaque should they produce and ship in order to maximize profit?

	Bronze (x_1)	Nickel (x_2)	Pewter (x_3)	Totals
Materials cost	10			
Labor hours			5	
Cost to ship		3		
Profit	13			z

(a) Add the slack variables appropriately to each constraint. Do not build the matrix yet.

(b) Build the initial simplex tableau. Make sure all appropriate labels are clearly written.

(c) The following is the simplex tableau after one pivot has been performed. If necessary, continue to pivot until you have reached the final simplex tableau that will produce the optimal solution. Clearly show this final matrix. Clearly box the pivot in each simplex matrix if it has one. Don't forget to show your row operations and quotients.

$$\begin{array}{ccccccc|c}
 x_1 & x_2 & x_3 & s_1 & s_2 & s_3 & z & \\
 \hline
 10 & 15 & 6 & 1 & 0 & 0 & 0 & 1200 \\
 20 & 0 & 51 & -4 & 15 & 0 & 0 & 28200 \\
 25 & 0 & 24 & -1 & 0 & 5 & 0 & 3800 \\
 \hline
 -25 & 0 & -3 & 17 & 0 & 0 & 15 & 20400
 \end{array}$$

(d) List the basic variables and their values.

(e) List the non-basic variables and their values.

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(f) The Texas Tech Forge should produce and ship _____ bronze plaques, _____ nickel plaques, and _____ pewter plaques to produced for a maximum profit of _____. Once this maximum profit is achieved, there will be _____ left in the budget for materials, _____ unused labor hours, and _____ left in the budget for shipping costs

4. (4%) An account of \$10,000 invested in a money market fund with the interest rate of 7% over 90 days. Find the maturity value of this account, assume a 360-day year.

5. (4%) Using the appropriate rule from rule of 70 and rule of 72, estimate the time (in years) so that the level of prices double if the general level of inflation in the economy is

(a) 3.5%

(b) 8.0%

6. (4%) Charlie makes monthly contributions to a retirement account that earn 3.5% interest compounded quarterly. The quarterly contributions are made at the end of each month and worth \$500 each.

(a) Find the effective interest rate.

(b) Find the future value of this account after 20 years.

7. (6%) Andrea deposits \$420 at the beginning of each month for 25 years in an account paying 5% compounded monthly. She then puts the total amount on deposit in another account paying 7.5% compounded quarterly for an additional 15 years. Find the final amount on deposit after the entire 40-year period.

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8. (6%) Kimberly buys a house for \$220,000. They pay \$50,000 down payment and secure a mortgage with interest charged at the rate of 5.9%/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 years, what monthly payment will they make?

(b) Find the total amount of interest she will pay

9. (6%) Large semitrailer trucks cost \$ 120,000 each. A trucking company buys such a truck and agrees to pay for it by a loan that will be amortized with 8 semiannual payments at 18% compounded semiannually. Complete an amortization schedule for the first **four** payments of the loan.

(Round to the nearest cent as needed)

Payment Number	Amount of Payment	Interest Payment	Applied to Principal	Balance (principal at the end of period)
0	_____	_____	_____	\$120,000
1	\$21680.93	\$	\$10880.93	\$
2	\$	\$9820.72	\$	\$97258.87
3	\$	\$8753.30	\$12927.63	\$84331.24
4	\$	\$	\$14091.11	\$

10. (5%) If it is known that an account pays a 5.38% effective rate and is compounded continuously, what is the minimal or stated interest for this account? Round the percentage to 2 decimal places. *Show all work for credit!*

11. (5%) 300 NBA fans at Texas Tech were asked about their preferences towards the three NBA teams in Texas: the Dallas Mavericks (**D**), the Houston Rockets (**H**), and the San Antonio Spurs (**S**). The results are as follows:

101 fans said they liked the Dallas Mavericks

119 fans said they liked the Houston Rockets

89 fans said they liked the San Antonio Spurs

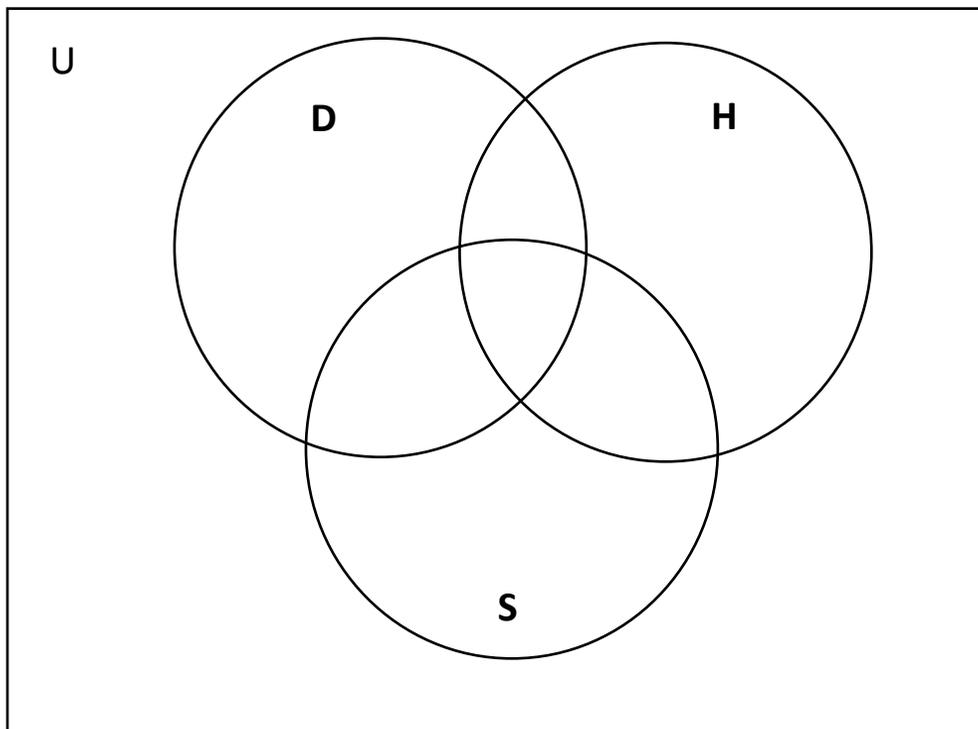
26 fans said they liked both the Dallas Mavericks and the Houston Rockets

18 fans said they liked both the Houston Rockets and the San Antonio Spurs

19 fans said they liked both the Dallas Mavericks and the San Antonio Spurs

5 fans said they liked all three teams

Fill the following Venn diagram and then answer the questions below:



Out of the 300 fans surveyed, how many fans liked (next page please)

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- (a) Exactly one of the three teams?
- (b) None of the three teams?
- (c) At least two of the three teams?
- (d) Only the Houston Rockets and the San Antonio Spurs?

12. (4%) Suppose E and F are two events from a sample space S . Given that $P(E) = 0.7$, $P(F^c) = 0.4$, and $P(E \cup F) = 0.88$.

(a) Use the Union Rule for Probability to find $P(E \cap F)$.

(b) Are the events E and F mutually exclusive? Why or why not?

(c) What is $P(E|F)$?

(d) Determine whether the events E and F are independent. Support your answer.

13. (3%) The probability that a battery will last 12 hr or more is .75, and the probability that it will last 23 hr or more is .18. Given that a battery has lasted 12 hr, find the probability that it will last 23 hr or more.

14. (3%) A desk lamp produced by Luminar was found to be defective. The company has three factories where the lamps are manufactured. The percentage of the total number of desk lamps produced by each factory and the probability that a lamp manufactured by that factory is defective are shown in the accompanying table. What is the probability that the defective lamp was manufactured in factory II?

Factory	Percent of Total Production	Probability of Defective Component
I	0.25	0.02
II	0.35	0.015
III	0.40	0.01

15. (5%) In a game show with a game called "Break-In", a contestant wins two prizes locked inside a vault by inputting the price of the more expensive item as the combination. If a contestant is given 5, 2, 8, and 1 as the possible numbers that go into the price of the more expensive item, how many different possible combinations are there? Assume that a number can be used multiple times, i.e. \$5,555 is a valid combination.

16. (5%)

(a) In a game of musical chairs, 8 children will sit on 7 stools arranged in a row (one will be left out). In how many ways can this happen?

(b) In an attempt to make the game more difficult, assume the children decide to take out two more stools. Thus there are now 8 children and 5 stools (so three children will be left out). In how many ways can this happen?

17. (5%) A box of flashlights contains 80 flashlights, of which 8 are defective. Find the probability that a sample of 4 flashlights contains

a) No defective flashlights?

b) At least one defective flashlight?

c) 2 or 3 defective flashlights?