

Honors Finite/MAT 217 Final Exam (Midterm) Review

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Problems 7–14 involve break-even points. In Problems 7–10 find the break-even point for the cost C of production and the revenue R . Graph each result.

7. $C = \$10x + \600 $R = \$30x$ resultant increase

11. **Break-Even Point** A manufacturer produces items at a daily cost of \$0.75 per item and sells them for \$1 per item. The daily operational overhead is \$300. What is the break-even point? Graph your result.

13. **Profit from Selling Newspapers** Each Sunday, a newspaper agency sells x copies of a certain newspaper for \$2.00 per copy. The cost to the agency for each newspaper is \$1.00. The agency pays a fixed cost for storage, delivery, and so on, of \$200 per Sunday. How many newspapers need to be sold for the agency to break even?

Problems 23–30 involve economics. In Problems 23–26 find the market price for each pair of supply and demand equations.

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25. $S = 20p + 500$ $D = 1000 - 30p$

27. **Market Price of Sugar** The supply and demand equations for sugar have been estimated to be given by the equations

$$S = 0.7p + 0.4 \quad D = -0.5p + 1.6$$

Find the market price. What quantity of supply is demanded at this market price? Graph both the supply and demand equations. Interpret the point of intersection of the two lines.

29. **Supply and Demand Problem** For a certain commodity the supply equation is given by

$$S = 2p + 5$$

At a price of \$1, 19 units of the commodity are demanded. If the demand equation is linear and the market price is \$3, find the demand equation.

p. 63 Solve using row operations

$$25. \left[\begin{array}{ccc|c} 1 & 0 & 2 & -1 \\ 0 & 1 & -4 & -2 \\ 0 & 0 & 0 & 0 \end{array} \right]$$

$$49. \begin{cases} 2x + y + z = 6 \\ x - y - z = -3 \\ 3x + y + 2z = 7 \end{cases}$$

$$59. \begin{cases} x - y = 5 \\ 2x - 2y = 6 \end{cases}$$

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$$15. \left[\begin{array}{cc|c} 1 & 0 & 4 \\ 0 & 1 & 5 \end{array} \right]$$

$$19. \left[\begin{array}{ccc|c} 1 & 2 & 0 & 1 \\ 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 0 \end{array} \right]$$

$$23. \left[\begin{array}{ccc|c} 1 & 0 & 0 & -1 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & 4 \\ 0 & 0 & 0 & 0 \end{array} \right]$$

$$25. \left[\begin{array}{ccc|c} 1 & 0 & -1 & 1 \\ 0 & 1 & 2 & 1 \end{array} \right]$$

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$$31. \begin{cases} 3x - 3y = 12 \\ 3x + 2y = -3 \\ 2x + y = 4 \end{cases}$$

$$33. \begin{cases} 2x - 4y = 8 \\ x - 2y = 4 \\ -x + 2y = -4 \end{cases}$$

$$37. \begin{cases} x - y = 1 \\ y - z = 6 \\ x + z = -1 \end{cases}$$

$$45. \begin{cases} 3x - y + 2z = 3 \\ 3x + 3y + z = 3 \\ 3x - 5y + 3z = 12 \end{cases}$$

53. **Mixing Chemicals** A chemistry laboratory has available three kinds of hydrochloric acid (HCl): 10%, 30%, and 50% solutions. How many liters of each should be mixed to obtain 100 liters of 25% HCl? Provide a table showing at least six of the possible solutions.

57. **Investment Goals** A retired couple has \$25,000 available to invest. They require a return on their investment of \$2000 per year. As their financial consultant, you recommend they invest some money in Treasury bills that yield 7%, some money in corporate bonds that yield 9%, and some in junk bonds that yield 11%. Prepare a table showing the various ways this couple can achieve their goal.

$$37. z = 3x + 4y$$

*maximum and minimum values
the constraints*

$$x + y \leq 10$$

$$2x + y \geq 10$$

$$x + 2y \geq 10$$

$$x \geq 0$$

$$y \geq 0$$

41. Find the maximum and minimum values of
 $z = 18x + 30y$ subject to the constraints $3y + 3x \geq 9$,
 $-x + 4y \leq 12$, and $4x - y \leq 12$.

9. Maximize

$$P = 5x_1 + 7x_2$$

subject to

$$2x_1 + 3x_2 \leq 12$$

$$3x_1 + x_2 \leq 12$$

$$x_1 \geq 0 \quad x_2 \geq 0$$

- p. 193 25. **Process Utilization** A jean manufacturer makes three types of jeans, each of which goes through three manufacturing phases—cutting, sewing, and finishing. The number of minutes each type of product requires in each of the three phases is given below:

Jean	Cutting	Sewing	Finishing
I	8	12	4
II	12	18	8
III	18	24	12

There are 5200 minutes of cutting time, 6000 minutes of sewing time, and 2200 minutes of finishing time each day. The company can sell all the jeans it makes and make a profit of \$3 on each Jean I, \$4.50 on each Jean II, and \$6 on each Jean III. Determine the number of jeans in each category that should be made each day to maximize profits.

28. **Survey Analysis** In a survey of 75 college students, it was found that of the three weekly news magazines *Time*, *Newsweek*, and *U.S. News and World Report*:

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23	read <i>Time</i>
18	read <i>Newsweek</i>
14	read <i>U.S. News and World Report</i>
10	read <i>Time</i> and <i>Newsweek</i>
9	read <i>Time</i> and <i>U.S. News and World Report</i>
8	read <i>Newsweek</i> and <i>U.S. News and World Report</i>
5	read all three

- How many read none of these three magazines?
- How many read *Time* alone?
- How many read *Newsweek* alone?
- How many read *U.S. News and World Report* alone?
- How many read neither *Time* nor *Newsweek*?
- How many read *Time* or *Newsweek* or both?

- p.314 35. There are 7 boys and 6 girls willing to serve on a committee. How many 7-member committees are possible if a committee is to contain:

- 3 boys and 4 girls?

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37. A person has 4 history, 5 English, and 6 mathematics books. How many ways can the books be arranged on a shelf if books on the same subject must be together?

38. Five people are to line up for a group photograph. If two of them refuse to stand next to each other, in how many ways can the photograph be taken?
39. In how many ways can a committee of 8 boys and 5 girls be formed if there are 10 boys and 11 girls eligible to serve on the committee?

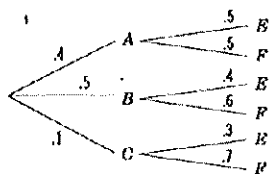
27. Three jars contain colored balls as follows:
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Jar	Red, R	White, W	Blue, B
I	5	6	5
II	3	4	9
III	7	5	4

One jar is chosen at random and a ball is withdrawn. The ball is red. What is the probability that it came from jar I? From jar II? From jar III? [Hint: Define the events E : Ball selected is red; U_I : jar I selected; U_{II} : jar II selected; and U_{III} : jar III selected.] Determine $P(U_I|E)$, $P(U_{II}|E)$, and $P(U_{III}|E)$ by using Bayes' formula.

33. **Oil Drilling** An oil well is to be drilled in a certain location. The soil there is either rock (probability .53), clay (probability .21), or sand. If it is rock, a geological test gives a positive result with 35% accuracy; if it is clay, this test gives a positive result with 48% accuracy; and if it is sand, the test gives a positive result with 75% accuracy. Given that the test is positive, what is the probability that the soil is rock? What is the probability that the soil is clay? What is the probability that the soil is sand?

Problems 1-14 on page 408 use the tree diagram below to find the probability:
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9. $P(A|E)$

13. $P(C|E)$

17. **Test for Cancer** A lung cancer test has been found to have the following reliability. The test detects 85% of the people who have cancer and does not detect 15% of these people. Among the noncancerous group it detects 92% of the people not having cancer, whereas 8% of this group are detected erroneously as having lung cancer. Statistics show that about 1.8% of the population has cancer. Suppose an individual is given the test for lung cancer and it detects the disease. What is the probability that the person actually has cancer?
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29. **Quality Control** Suppose that 5% of the items produced by a factory are defective. If 8 items are chosen at random, what is the probability that
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- (a) Exactly 1 is defective?
- (b) Exactly 2 are defective?
- (c) At least 1 is defective?
- (d) Fewer than 3 are defective?

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43. **Product Testing** A supposed coffee connoisseur claims she can distinguish between a cup of instant coffee and a cup of drip coffee 80% of the time. You give her 6 cups of coffee and tell her that you will grant her claim if she correctly identifies at least 5 of the 6 cups.

- What are her chances of having her claim granted if she is in fact only guessing?
- What are her chances of having her claim rejected when in fact she really does have the ability she claims?

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5. Mary will win \$8 if she draws an ace from a set of 10 different cards from ace to 10. How much should she pay for one draw?

7. David gets \$10 if he throws a double on a single throw of a pair of dice. How much should he pay for a throw?

9. **Raffles** In a raffle 1000 tickets are being sold at \$1.00 each. The first prize is \$100, and there are 3 second prizes of \$50 each. By how much does the price of a ticket exceed its expected value?

15. Sarah draws a card from a deck of 52 cards. She receives 40¢ for a heart, 50¢ for an ace, and 90¢ for the ace of hearts. If the cost of a draw is 15¢, should she play the game? Explain.

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1. The following scores were made on a 60-item test:

25	30	34	37	41	42	46	49	53
26	31	34	37	41	42	46	50	53
28	31	35	37	41	43	47	51	54
29	32	36	38	41	44	48	52	54
30	33	36	39	41	44	48	52	55
30	33	37	40	42	45	48	52	

- Set up a frequency table for the above data. What is the range?
- Draw a line chart for the data.
- Draw a histogram for the data using a class interval of size 2.
- Draw the frequency polygon for this histogram.

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In Problems 1–8 compute the mean, median, and mode of the given set of data.

7. 48, 65, 80, 92, 80

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In Problems 3–8 compute the standard deviation for each set of data.

7. 85, 75, 62, 78, 100

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5. Find the mean, median, and mode for each of the following sets of measurements.

(a) 12, 10, 8, 2, 0, 4, 10, 5, 4, 4, 8, 0

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9. In seven different rounds of golf, Joe scores 74, 72, 76, 81, 77, 76, and 73. What is the standard deviation of his scores?

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13. Women's Heights The average height of 2000 women in a random sample is 64 inches. The standard deviation is 2 inches. The heights have a normal distribution.

- How many women in the sample are between 62 and 66 inches tall?
- How many women in the sample are between 60 and 68 inches tall?
- How many women in the sample are between 58 and 70 inches tall?

- 17. Life Expectancy of Shoes** Records show that the average life expectancy of a pair of shoes is 2.2 years with a standard deviation of 1.7 years. A manufacturer guarantees that shoes lasting less than a year are replaced free. For every 1000 pairs sold, how many pairs should the manufacturer expect to replace free? Assume a normal distribution.

5. Given a normal distribution with a mean of 13.1 and a standard deviation of 9.3, find the Z-score equivalent of the following scores in this distribution:

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7, 9, 13, 15, 29, 37, 41

15. Student Weights The weight of 100 college students closely follows a normal distribution with a mean of 130 pounds and a standard deviation of 5.2 pounds.

- How many of these students would you expect to weigh at least 142 pounds?
- What range of weights would you expect to include the middle 70% of the students in this group?

extra z-score problems:

- Find a z-score such that 10% of the area under the curve is to the left of the score.
- Find a z-score such that 85% of the area under the curve is to the right of the score.

In Problems 23–28 suppose a binomial experiment consists of 750 trials and the probability of success for each trial is .4. Then

p. 450 $\mu = np = 300$ and $\sigma = \sqrt{npq} = \sqrt{(750)(.4)(.6)} = 13$

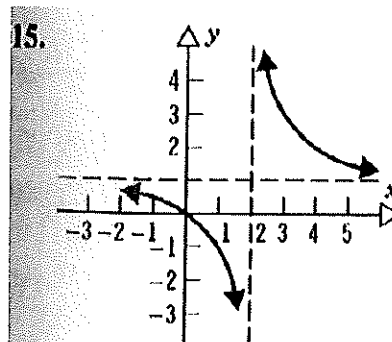
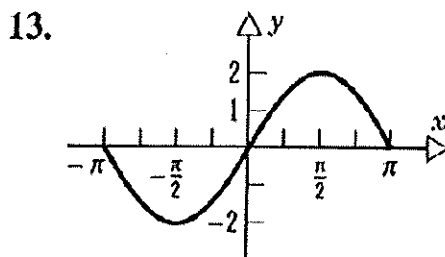
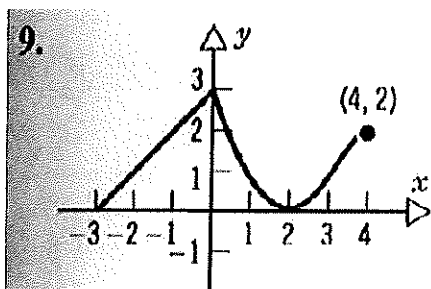
Approximate the probability of obtaining the number of successes indicated by using a normal curve.

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29. **Lifetime Batting Averages** A baseball player has a lifetime batting average of .250. If, in a season, this player comes to bat 300 times, what is the probability that at least 80 and no more than 90 hits occur? What is the probability that 85 or more hits occur?

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In Problems 9–20 the graph of a function is given. Use the graph to find (a) its domain and range; (b) the intervals on which it is increasing, decreasing, or constant; (c) the intercepts, if any.



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In Problems 37–46 find the difference quotient,

$$\frac{f(x + h) - f(x)}{h} \quad h \neq 0$$

for each function. Be sure to simplify.

41. $f(x) = 3x^2 - 2x$

p. 538 Graph, and evaluate $f(2)$

$$61. f(x) = \begin{cases} 2x & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$$

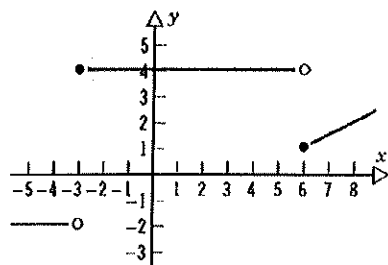
$$63. f(x) = \begin{cases} 1 + x & \text{if } x < 0 \\ x^2 & \text{if } x \geq 0 \end{cases}$$

$$65. f(x) = \begin{cases} |x| & \text{if } -2 \leq x < 0 \\ 1 & \text{if } x = 0 \\ x^3 & \text{if } x > 0 \end{cases}$$

In Problems 83 and 84 find a piecewise-defined function whose graph is shown in the given figure. Note that each graph is made up of line segments.

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84.



p. 553 In Problems 1–16 evaluate each expression.

1. $27^{2/3}$

13. $(9^{1/3})(3^{1/3})$

57. **Compound Interest** Find the amount after 1 year if p. 557 \$500 is invested at 6% compounded continuously for 1 year. What is the amount if the rate is $6\frac{1}{4}\%$ compounded quarterly? Which is better?

67. **Study Habits** In a certain mathematics class, the number of applied problems a student is expected to have solved by the end of week t of the semester is approximately

$$y = 12e^{0.5t}$$

Give the expected numbers after each week:

- (a) Third
- (c) Ninth

- (b) Sixth
- (d) Twelfth

In Problems 11–16 evaluate each expression.

p. 567 15. $\log_2 24 - \log_2 12$

In Problems 17–24 use $\log_{10} 2 = 0.3010$, $\log_{10} 3 = 0.4771$,
and $\log_{10} 5 = 0.6990$ to compute each quantity.
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17. $\log_{10} 12$

p. 567 solve for x:

32. $\log_5 x = 2$

41. $\ln x + \ln 6 = \ln 7$

45. $4 = e^{0.08x}$

47. $6 + (3)2^{x+1} = 8$

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55. **Doubling Time** How long will it take an amount P to double if it is invested at 6% interest compounded continuously?

57. **Tripling Time** How long will it take an amount P to triple if it is invested at 10% interest compounded continuously?

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7. **Supply Equation** The following table shows the supply (in thousands of units) of a product at various prices (in dollars):

Price, x	3	5	6	7
Supply, y	10	13	15	16

- (a) Find the least squares line of best fit to the above data.
(b) Use the equation of this line to estimate the supply of the product at a price of \$8.

9. **Advertising vs. Sales** A business would like to determine the relationship between the amount of money spent on advertising and its total weekly sales. Over a period of 5 weeks it gathers the following data:

Amount Spent on Advertising (in thousands)	Weekly Sales Volume (in thousands)
x	y
10	50
17	61
11	55
18	60
21	70

Find a least squares line of best fit to the above data.