

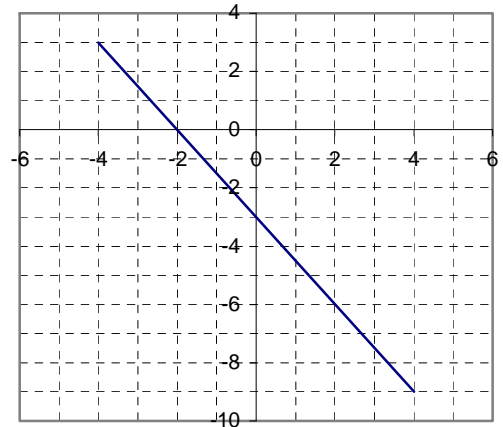
MA 110**REVIEW PROBLEMS FOR THE FINAL EXAM**

This review is to accompany the course text which is *Finite Mathematics for Business, Economics, Life Sciences, and Social Sciences*, 11th Edition by Barnett, Ziegler, & Byleen and published by Pearson Prentice Hall.

1. Find the slope and y-intercept for
 - a) $y = -5x + 35$
 - b) $2x - 3y = 10$

2. Find the equation of the line
 - a) with y-intercept 5 and slope $-1/2$.
 - b) with slope 0 and y-intercept 2.
 - c) with slope undefined and passing through the point (3,6).
 - d) with slope -4 and passing through (-2,-3).
 - e) passing through (1,-2) and (-3,5).
 - f) passing through (-5, 6) that is vertical.
 - g) passing through (-5, 6) that is horizontal.

3. Use the graph of the line on the right to find the following:
 - a) the x-intercept
 - b) the y-intercept
 - c) the slope
 - d) the slope - intercept form of the equation of the line.



4. A plant can manufacture 80 golf clubs per day for a total daily cost of \$7,647 and 100 golf clubs per day for a total daily cost of \$9,147.
 - a) Assuming that total daily cost, C , and production, x , are linearly related, find the total daily cost of producing x golf clubs.
 - b) Graph the total daily cost for $0 \leq x \leq 200$.
 - c) Write a sentence that interprets the slope.
 - d) Write a sentence that interprets the y-intercept.
 - e) Use this model to predict the total daily cost when 170 golf clubs are manufactured.

5. A middle eastern country exports a constant amount of oil each year so its oil reserves have been decreasing linearly with time according to the equation $y = -14t + 350$ where y represents the country's reserves in millions of barrels t years after 2000.
 - a) Determine and interpret the slope of this straight line.
 - b) Determine the y-intercept and explain its significance.
 - c) Find the amount of oil in the country's reserves in 2005.
 - d) If this trend continues, when will the oil run out?

14. How long will it take until an account will have \$4,500 if \$2,500 is invested now at:
- 15% compounded monthly?
 - 15% compounded continuously?
15. Suppose that you deposit \$1000 at the end of each year into an account paying 7.5% interest compounded annually. How much money would you have at the end of 10 years?
16. A company establishes a sinking fund for plant renovation in 8 years at an estimated cost of \$2,500,000.
- How much should be invested semiannually into an account paying 8.76% compounded semiannually to achieve this objective?
 - How much interest will the account earn in the 8 years?
17. A \$390,000 loan is to be repaid in equal monthly installments at 6% interest compounded monthly.
- If the term of the loan is 30 years, find the amount of each monthly payment.
 - How much interest was paid on the loan over the 30 - year period?
18. An ordinary annuity earns 7.5% compounded monthly and has a current balance of \$500,000. The owner of the account would like to retire and withdraw \$4,000 monthly. How many monthly withdrawals can be made?
19. Solve each of the following linear systems.
- $\begin{cases} 3x + 2y = 1 \\ y = x - 12 \end{cases}$
 - $\begin{cases} 3x + 2y = 9 \\ 5x + 4y = 7 \end{cases}$
 - $\begin{cases} 4x - 6y = -7 \\ -2x + 3y = 1 \end{cases}$
 - $\begin{cases} 3x - 5y = 15 \\ -9x + 15y = -45 \end{cases}$
20. Assume that the price (in \$) per unit d of a certain item to the consumer is given by the equation $d = 35 - 0.10x$, where x is the number of units in demand. The price (in \$) per unit s from the supplier is given by the equation $s = 0.2x + 20$, where x is the number of units supplied. Find the equilibrium price and the equilibrium quantity.
21. Use either the Gauss-Jordan method or matrix inverses to solve each of the following linear systems.
- $\begin{cases} 2x + y - z = -1 \\ x + 3y + 2z = 7 \\ 3x - y + z = 11 \end{cases}$
 - $\begin{cases} x - 2y + 3z = 2 \\ 3x - 4y - z = 1 \\ 2x - 3y + z = 1 \end{cases}$
 - $\begin{cases} x + 2y - z = 0 \\ 3x - y + z = 6 \\ -2x - 4y + 2z = 0 \end{cases}$
22. Let $A = \begin{bmatrix} 2 & 4 \\ 3 & 5 \end{bmatrix}$ $B = \begin{bmatrix} 2 & -5 & 0 \\ 1 & 4 & -1 \end{bmatrix}$ $C = \begin{bmatrix} 4 & -2 \\ 1 & 0 \end{bmatrix}$
- Perform the indicated matrix operation, if possible:
- $A + C$
 - AB
 - BA
 - $A + B$
 - A^2
 - $C - A$
 - $\frac{1}{3}A$
23. Find the inverse of the matrix $A = \begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix}$.

24. Maximize $z = 5x + 4y$ subject to

$$2x + y \leq 420$$

$$2x + 2y \leq 500$$

$$2x + 3y \leq 600$$

$$x \geq 0, y \geq 0$$

25. Formulate the following linear programming problem. **DO NOT SOLVE IT.**

A nutritionist at the hospital has been asked to prepare a special diet for certain patients. She has decided that the meals should contain a minimum of 400 mg of calcium, 10 mg of iron, and 40 mg of vitamin C. These requirements can be met with two foods, A and B. Each ounce of food A contains 30 mg of calcium, 1 mg of iron, 2 mg of vitamin C, and 3 mg of cholesterol. Each ounce of food B contains 25 mg of calcium, 0.5 mg of iron, 5 mg of vitamin C, and 6 mg of cholesterol. How many ounces of each type of food should be used in a meal so that the cholesterol content is minimized and the minimum requirements of calcium, iron, and vitamin C are met?

26. Consider the subsets $A = \{x, y, u, w\}$, $B = \{y, u, v\}$ and $C = \{x, z, v\}$ of the universal set

$$U = \{x, y, z, u, v, w\}.$$

List the elements in each of the following sets:

a) $A \cap B$

b) $A \cup C$

c) $A \cap B \cap C$

d) B'

e) $(A \cup B)'$

f) $(A \cap B') \cup (A' \cap B)$

27. A government agency classifies loan applicants according to sex, marital status, and unemployment status. Let U be the set of all applicants, and let F , M and E be the sets of those who are female, married, and employed, respectively. Describe each of the following categories using set operations:

a) Unemployed unmarried males

b) Working wives

c) Those who are either single or unemployed

d) Women who are either married or employed

28. Of the 1000 freshmen at a certain college, 700 take mathematics courses, 300 take mathematics and economics courses, and 200 do not take any mathematics or economics.

a) How many of the freshmen take an economics course?

b) How many take an economics course but not a mathematics course?

29. A California license plate consists of three letters followed by three digits. How many different license plates are possible?

30. A Scrabble player has seven letter-tiles in her tray forming the "word" NARPLES.

a) How many five-letter words (meaningful or not) can be formed with these seven tiles?

b) How many of them begin with the letter S?

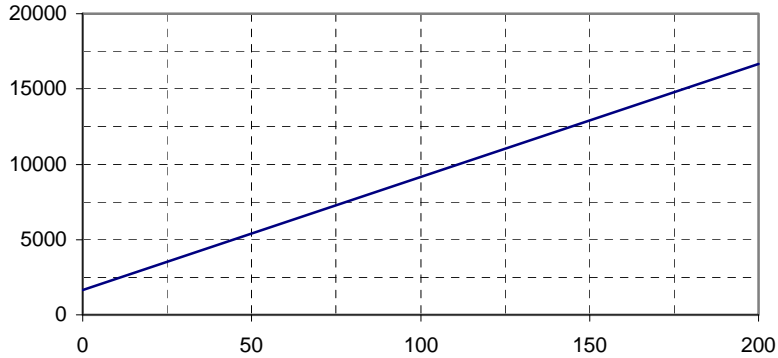
40. A department store receives a shipment of 31 new cell phones. There are 2 defective cell phones in the shipment.
- If one cell phone is selected from the shipment, what is the probability that it is defective?
 - Suppose this shipment of 31 cell phones with 2 defective is representative of a much larger set of 2500 cell phones. How many defective cell phones would you expect in this larger set of 2500?
41. A group of 10 people consists of 5 men and 5 women. A committee of 4 is chosen from this group. What is the probability that one or more of the committee members is a man?
42. A class of 40 students has 10 honor students and 13 athletes. Three of the honor students are also athletes. One student is chosen at random. Find the probability that this student is an athlete if it is known that the student is not an honor student.
43. An experiment consists of rolling two fair dice and adding the dots on the two sides facing up. Assuming each simple event is as likely as any other, find the probability of the sum of the dots indicated.
- Sum is 2.
 - Sum is divisible by 2.
 - Sum is divisible by 3.
 - Sum is divisible by 2 and 3.
 - Sum is divisible by 2 or 3.
44. Companies A, B and C produce 10%, 40% and 50% respectively of the automobiles sold in a certain region. In that region, 2% of company A's cars, 1% of B's cars and 3% of C's cars have been recalled. Suppose an automobile that has been recalled is selected at random. What is the probability (to the nearest hundredth) that it was sold by Company B?
45. Mice in a certain experiment involving a choice between path A and B are observed to have the following pattern:
Of those who choose path A one day, 30% choose A the next day and 70% choose B, while of those who choose B one day, 80% choose B the next day and 20% choose A.
- Set up the transition matrix for this situation.
 - If 50% choose A on Monday and 50% choose B, what percentages choose each path on Tuesday? On Wednesday?
 - In the long run, what portion of the mice choose A each day and what portion choose B?

*****ANSWERS FOR MA 110 REVIEW PROBLEMS*****

1. a) slope = $m = -5$, y-intercept = $b = 35$ b) $m = \frac{2}{3}$, $b = \frac{-10}{3}$
2. a) $y = -\frac{1}{2}x + 5$ b) $y = 2$ c) $x = 3$
- d) $y = -4x - 11$ e) $y = -\frac{7}{4}x - \frac{1}{4}$ f) $x = -5$ g) $y = 6$

3. a) $(-2, 0)$ b) $(0, -3)$ c) $m = \frac{-3}{2}$ d) $y = \frac{-3}{2}x - 3$

4. a) $C(x) = 75x + 1647$
b)



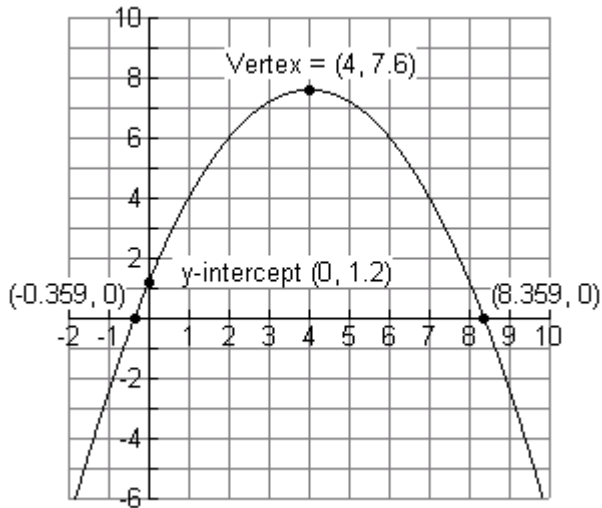
- c) According to this model, when the number of golf clubs manufactured is increased by one the daily cost is increased by \$75.
- d) According to this model, the fixed cost is \$1,647.
- e) $C(170) = \$14,397$

5. a) slope = -14; Starting with the year 2000, the country exports 14 million barrels of oil per year.
b) y-intercept: $(0, 350)$; In the year 2000 the country had 350 million barrels of oil in its reserves.
c) 280 million barrels;
d) in the year 2025

6. a) $y = 2.7x + 31.4$ b) 58.4%
- c) The slope of 2.7 means for each additional hour of study the test score will increase by 2.7%
- d) The y-intercept of 31.4 means that if the student did not study the test score would be 31.4%

7. a) $R(x) = x(50 - 1.25x) = 50x - 1.25x^2$ ($R(x)$ is in thousands of dollars.)
- b) Break-even occurs when outputs are $x = 16 \pm 8\sqrt{2}$ thousand units; that is:
 $x = 16 - 8\sqrt{2} \approx 4.686$ thousand units = 4,686 units and
 $x = 16 + 8\sqrt{2} \approx 27.314$ thousand units = 27,314 units.
- c) Loss occurs for $1 \leq x < 4.686$ or $27.314 < x \leq 40$
- d) Profit occurs for $4.686 < x < 27.314$
- e) \$160,000; 16,000 units
- f) \$30

8. a) $(0, 1.2)$ b) $(4 + \sqrt{19}, 0)$, $(4 - \sqrt{19}, 0)$ c) $(4, 7.6)$ d) maximum: 7.6 e) $y \leq 7.6$ or $(-\infty, 7.6]$
f)



9. 11.4% 10. a) \$9,923.78 b) \$9,924.82
11. a) \$10,163.97 b) \$10,263.65
12. \$2,059.93 matures to \$4,999.99 so to ensure a maturity value of \$5,000 or more the answer is \$2,059.94
13. 9% compounded quarterly is an effective rate of 9.31%.
9.25% compounded annually is an effective rate of 9.25%
∴ 9% compounded quarterly is better.
14. a) 48 months b) 3.919 years
15. \$14,147.09
16. a) \$111,107.61 b) \$722,278.24
17. a) \$2,338.25 b) \$451,770
18. 243
19. a) $x = 5$, $y = -7$ b) $x = 11$, $y = -12$ c) No solution (Inconsistent system)
- d) Infinitely many solutions. (Dependent system.)
Using parameter t , the solution is $x = t$, $y = \frac{3}{5}t - 3$, where t is any real number.
20. Equilibrium price: \$30 per unit; Equilibrium quantity: 50 units

21. a) $x = 2, y = -1, z = 4$ b) No solution

c) Infinitely many solutions.

Using parameter t , $x = -\frac{1}{7}t + \frac{12}{7}$, $y = \frac{4}{7}t - \frac{6}{7}$, $z = t$, **where t is any real number.**

22. a) $\begin{bmatrix} 6 & 2 \\ 4 & 5 \end{bmatrix}$ b) $\begin{bmatrix} 8 & 6 & -4 \\ 11 & 5 & -5 \end{bmatrix}$ c) not possible

d) not possible e) $\begin{bmatrix} 16 & 28 \\ 21 & 37 \end{bmatrix}$ f) $\begin{bmatrix} 2 & -6 \\ -2 & -5 \end{bmatrix}$ g) $\begin{bmatrix} \frac{2}{3} & \frac{4}{3} \\ 1 & \frac{5}{3} \end{bmatrix}$

23. $A^{-1} = \begin{bmatrix} \frac{3}{2} & \frac{-1}{2} \\ -2 & 1 \end{bmatrix}$

24. Maximum of 1170 occurs at $x = 170, y = 80$

25. Let x = the number of ounces of food A and y = the number of ounces of food B.
Minimize $C = 3x + 6y$ subject to :

$$30x + 25y \geq 400$$

$$x + 0.5y \geq 10$$

$$2x + 5y \geq 40$$

$$x \geq 0, y \geq 0$$

26. a) $\{y, u\}$ b) $\{x, y, z, u, v, w\}$ c) empty set d) $\{x, z, w\}$
e) $\{z\}$ f) $\{x, v, w\}$

27. a) $E' \cap F' \cap M'$ b) $F \cap M \cap E$ c) $M' \cup E'$ d) $F \cap (M \cup E)$

28. a) 400 b) 100

29. $(26)^3 (10)^3 = 17,576,000$

30. a) $P_{7,5} = 7(6)(5)(4)(3) = 2,520$ b) $1(6)(5)(4)(3) = 360$

31. a) $\{bbb, bbg, bgb, bgg, gbb, gbg, ggb, ggg\}$
b) $3/8$ c) $1/2$ d) $1/8$

32. 20,790

33. 30,045,015

34. a) $C_{7,3} = 35$

b) $P_{7,3} = 210$

35. a) $\frac{1}{2}$
e) $\frac{4}{9}$

b) $\frac{3}{4}$
f) $\frac{1}{6}$

c) 1

d) $\frac{1}{3}$

36. 0.8

37. a) 0.6

b) 0.4

38. $\frac{25}{77} \approx .325$

39. a) $\frac{C_{5,4}}{C_{23,4}} = \frac{5}{8855} \approx 0.000565$

b) $\frac{C_{5,3} \cdot C_{18,1}}{C_{23,4}} = \frac{180}{8855} \approx 0.020327$

c) $\frac{C_{5,2} \cdot C_{18,2}}{C_{23,4}} = \frac{1530}{8855} \approx 0.172784$

d) $\frac{5+180+1530}{8855} = \frac{1715}{8855} \approx 0.193676$

40. a) $\frac{2}{31}$

b) $\frac{2}{31}(2500) \approx 161.3$ so the expected number of defective cell phones is 161.

41. 0.98

42. $\frac{1}{3} \approx 0.333$

43. a) $\frac{1}{36}$

b) $\frac{1}{2}$

c) $\frac{1}{3}$

d) $\frac{1}{6}$

e) $\frac{2}{3}$

44. 0.19

45. a) $\begin{bmatrix} .3 & .7 \\ .2 & .8 \end{bmatrix}$

b) Tues: $[\ .25 \ .75]$

c) 2/9 choose A

Wed.: $[\ .225 \ .775]$

7/9 choose B