BOROUGH OF MANHATTAN COMMUNITY COLLEGE DEPARTMENT OF MATHEMATICS
MAT 051 Midterm Examination Review

Do ONLY 4 CHAPTERS. Your instructor will tell you which 4 chapters to complete.

*Everyone is required to do Chapter 1, and then instructors will **choose three other chapters** for all students in the section to complete. **Students must then complete ALL the problems in each of the four sections required by their instructor**. Students will NOT be able to choose which sections to complete, and will receive NO extra points for problems done in the unassigned chapters for their section.*

Chapter 1 Algebraic Expressions and Exponents - REQUIRED

1. Perform the indicated operations and simplify:

    a. $(-3)^2 + 2\cdot(-5) =$

    b. $\left(\dfrac{2}{3}\right)\left(\dfrac{-6}{10}\right) =$

    c. $-3 + 16 \div (-8) + 5 =$

2. Evaluate: $2p + 3q^2$, when $p = -4, q = 2$.

3. Express each of the following in terms of x:
    a.   5 less than the number x

    b.   5 more than the product of 9 and x

    c.   Five times the difference of twice x and 3

4. Find the sum of $-x - 3y$ and $4x + y$.

5. Perform the indicated operations and simplify:

    a. $\left(-\dfrac{2}{3}\right)^3$

    b. $-(-3)^4$

    c. $2 - 5[3x - (4 + 2x)]$

Chapter 2 Linear Equation and Inequalities

6. Simplify the expression $7 - 3(2x - 4) - 8$.

7. Simplify: $5(2x + 3y) - 3(3x - 5y)$

8. Find the value of $x^2 - 2xy + y^2$ when $x = 3$ and $y = -4$.

9. Find the value of $b^2 - 4ac$ when $a = 1$, $b = -6$, $c = 7$

10. Solve for x: $2x - 4 = 5x + 2$

11. Solve for x: $x - 2(x + 2) = x - 2$

12. Solve for x: $3(2x-5)-(2x-4)=6-(4x+5)$

13. Solve the inequality for x, and graph the solution on the real number line. $8-6(x-3)\leq-4x+12$

14. Solve the inequality for x, and graph the solution on the number line: $-7x+4>3x+44$

15. Solve the inequality for x, and graph the solution on the number line. $4x-2>6x+8$

16. Solve the inequality for x, and graph the solution on the number line. $\frac{4}{3}x-2>\frac{2}{9}x+\frac{1}{6}$

17. Solve the equation: $\dfrac{2}{9}=\dfrac{8}{x}$

18. Solve the equation: $\dfrac{4}{x}=\dfrac{6}{8}$

19. The length of a rectangle is 5 inches more than 3 times the width. If the perimeter is 26 inches, find the length and width.

20. One number is four less than three times another. If their sum is increased by five, the result is twenty five. Find the numbers.

21. If $3x-5=20$, then $4x=?$

22. The sum of three consecutive even integers is -108. Find the numbers.

23. The sum of two consecutive integers is 37. Find the numbers.

24. Michael has $1.85 in dimes and Nickels. He has a total of 25 coins. How many of each does he have?

25. Shahin is 3 years older than his sister. In 10 year's time the sum of their ages will be 77 years. How old is each of them now?

26. Using the formula, $Pv=nrt$, solve for r.

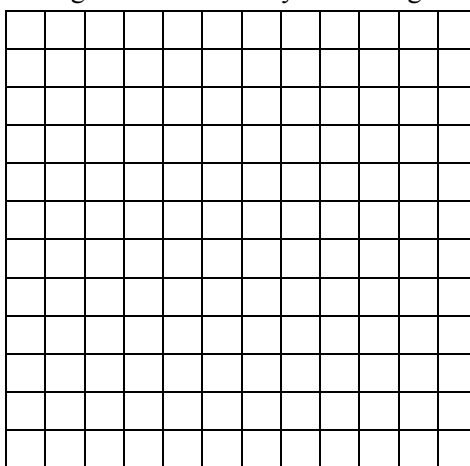**Chapter 3 Linear Equations and Inequalities in Two Variables**

27. Find the x- and y-intercepts for $3x-2y=-6$, and then use them to draw the graph.
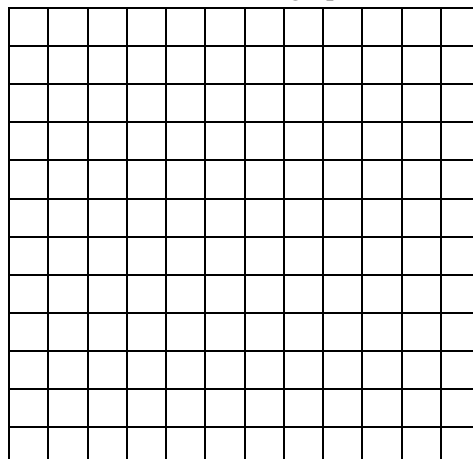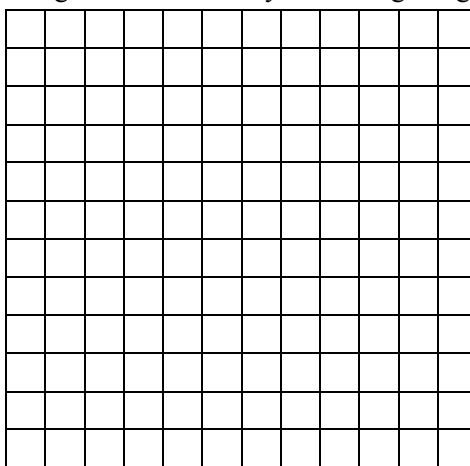
28. Sketch the graph of the equation $-4x + 5y = 20$ on the rectangular coordinate system using the grid below.
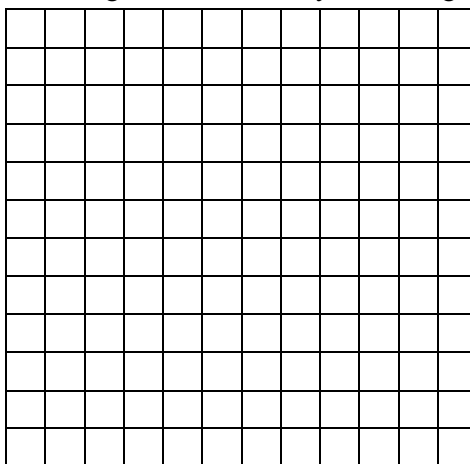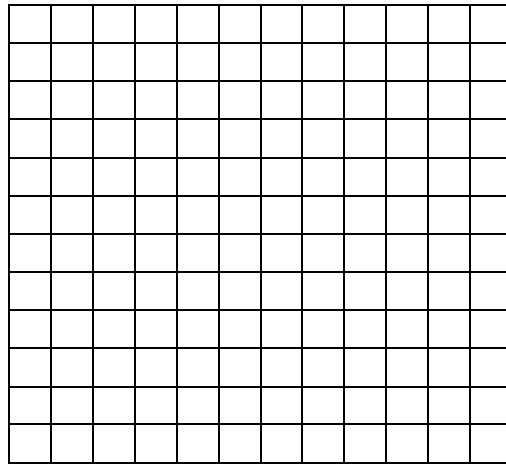
29. Sketch the graph of the equation $y = -2x + 4$ on the rectangular coordinate system using the grid below.
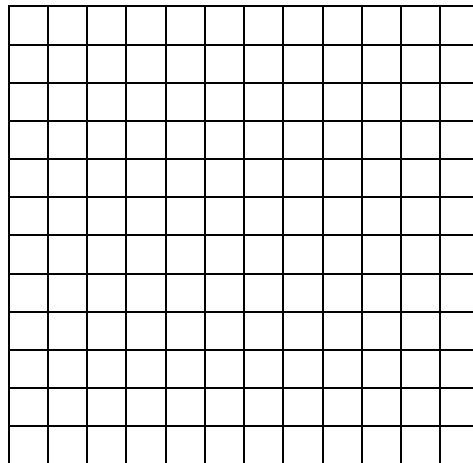
30. Sketch the graph of the equation $y = 2x - 4$ on the rectangular coordinate system using the grid below.

31. Sketch the graph of the equation $y = 3x + 1$ on the rectangular coordinate system using the grid below.

32. Sketch the graph of the equation $y = -\dfrac{2}{3}x + 2$ on the rectangular coordinate system using the grid below.

33. Find the slope of the line through the given points $(2, -4)$ and $(8, -2)$.

34. Given the equation $-3x + 4y = -12$, determine the slope and y-intercept.

35. Find the slope of a line which is parallel to $2x + 4y = 6$.

36. Find y if the line through $(-2, 4)$ and $(6, y)$ has a slope of -2.

37. Find y if the line through $(3, -6)$ and $(6, y)$ has a slope of 5.

38. Find the equation of the line that contains the point $(-1, -5)$ and has slope 2. Write the answer in slope-intercept form.

39. Find the equation of the line with slope -2 that contains the point $(-4, 3)$. Write the answer in slope-intercept form.

40. Find the equation of the line with slope -3 that contains the point $(-2, 5)$. Write the answer in slope-intercept form.

41. Find the equation of the line through $(-2, 1)$ with slope $\dfrac{1}{2}$. Write the answer in slope-intercept form.

42. Find the equation of the line that passes through the points $(2, 4)$ and $(-3, -1)$.

43. Find the equation of the line that passes through the points $(-1, -5)$ and $(2, 1)$.

44. Find the equation of the line that passes through the points $(3, 1)$ and $(-3, -5)$.

45. Find the equation of the line that passes through the points $(2, 5)$ and $(0, 1)$.

46. Find the slope of a line which is perpendicular to $y = 2x + 3$.

Functional Notation

47. Given $f(x) = 9 - x^2$, evaluate $f(7)$.

48. Given $g(x) = \dfrac{1}{x} + 4$, evaluate and siplify $g(3)$.

49. Given $h(x) = \dfrac{7 - x}{x + 9}$, evaluate and simplify $h(5)$.

50. Given $t(x) = x^2 + 3x - 10$, evaluate $t(8)$.

Chapter 4 Systems of Linear Equations

51. Is the ordered pair $(4,5)$ a solution to the system:
$2x - 3y = -7$
$4x - 5y = 0$

52. Is the ordered pair $(-2,1)$ a solution to the system:
$2x + 3y = -1$
$3x - y = -7$

53. Solve the system of equation by any convenient method.
$5x - 4y = -7$
$-6x + 8y = 2$

54. Solve by elimination.
$2x + 3y = 4$
$5x + 4y = 3$

55. Solve the system of equation by any convenient method.
$-5x + 2y = -6$
$10x + 7y = 34$

56. Solve by substitution.
$3x - 3y = 7$
$y = -1 + x$

57. A club sells tickets to an event for $8 for children and $10 for adults. If the total number of tickets sold for the event was 220 and the total amount received from tickets sales was $2030, how many children's tickets and how many adult tickets were sold?

58. David has $2.85 in dimes and quarters. He has a total of 15 coins. How many of each does he have?

59. Two numbers have a sum of 15. One number is 4 more than the other. Find the numbers.

Updated: 2/1/2013

60. One number is 5 more than another. Their sum is 35. Find the two numbers.

61. One number is 2 more than three times another. Their sum is 26. Find the two numbers.

Chapter 5 Exponents and Polynomials (includes scientific notation)

62. Simplify each expression. Write all answers with positive exponents only.
   a. $x^{-3}x^8$
   b. $\left(3y^5\right)^{-2}\left(2y^{-4}\right)^3$
   c. $\dfrac{-24r^2s^3t^2}{-30r^4s^3}$

63. What is the product of $8p^2q^3$ and $3pq^2$?

64. Subtract: $2a^2 - 4a$ from $3a + a^2$.

65. Perform the indicated operations and simplify:
   a. $(-5x^3y)^2$
   b. $2x^2y - 3xy(x-1)$
   c. $2y^3(y^2 - 5y + 4)$
   d. $\dfrac{12x^7 - 3x^4}{3x^4}$
   e. $(2x-5)(3x+4)$
   f. $(3-4y)^2$
   g. $(3x-1)(2x^2 - x + 6)$

66. Express in scientific notation:
   a. 34,600,000
   b. 0.0000056

67. Express in standard notation:
   a. 2.94×10^{-6}
   b. 7×10^5

Chapter 6 Factoring Polynomials

68. Factor the following expressions completely:
   a. $4z^2 - 8z$
   b. $2bx - 6by + 4bz$
   c. $16y^2 - 81$
   d. $x^2 - x - 20$
   e. $25r^3t^2 + 100r^2t^5$
   f. $50a^2 - 98b^2$
   g. $4x^2 + 3x - 7$
   h. $4x^5 - 64x^3$
   i. $x^4 - 13x^2 + 36$
   j. $9x^3 + 36x^2 - x - 4$

Chapter 7 Rational Expressions

65. Reduce to lowest terms

     a. $\dfrac{x-2}{x^2-4}$

     b. $\dfrac{x^2-25}{x^2-10x+25}$

     c. $\dfrac{2x^2-2}{6x+6}$

     d. $\dfrac{2x^2+x-3}{2x^2+3x}$

66. Multiply or divide as indicated. Reduce all answers to lowest terms.

     a. $\dfrac{3x-12}{2x}\cdot\dfrac{6x^2}{x-4}$

     b. $\dfrac{x^2+x-2}{x^2+5x+6}\cdot\dfrac{x}{x-1}$

     c. $\dfrac{x^2-64}{x-8}\div(2x+16)$

     d. $\dfrac{x^2-2x-15}{2x^3}\div\dfrac{x^2-9}{x}$

67. Find the following sums and differences. Simplify completely.

     a. $\dfrac{y^2}{y-2}+\dfrac{4}{y-2}$

     b. $\dfrac{x}{x+7}+\dfrac{5}{7}$

     c. $\dfrac{x}{x+3}-\dfrac{2}{3x}$

     d. $\dfrac{2x}{x-1}-\dfrac{x+5}{x^2-1}$

     e. $\dfrac{2x-9}{x^2-2x-24}-\dfrac{5}{x-6}$

68. Solve the following equations.

    a. $\dfrac{5}{x}+3=\dfrac{1}{2}$

    b. $\dfrac{x-2}{2}-\dfrac{2x}{5}=\dfrac{1}{10}$

    c. $\dfrac{4}{x+1}=\dfrac{3}{x-2}$

    d. $1-\dfrac{6}{x}=\dfrac{-8}{x^2}$

    e. $\dfrac{x}{x-6}+\dfrac{1}{2}=\dfrac{6}{x-6}$

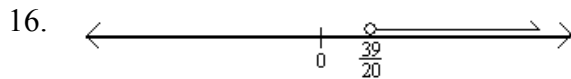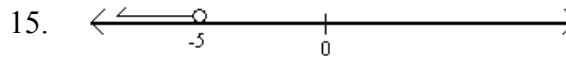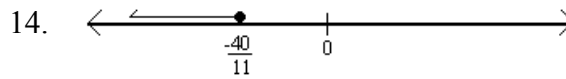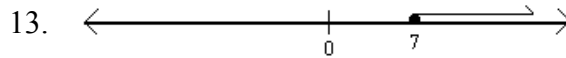   f. $\dfrac{3x}{x-4}-\dfrac{2x}{x-3}=\dfrac{6}{x^2-7x+12}$

Chapter 1

1. a. -1 b. $-\frac{2}{5}$ c. 0
2. 4
3. a. $x-5$ b. $9x+5$ c. $5(2x-3)$
4. $3x-2y$
5. a. $-\frac{8}{27}$ b. -81 c. $-5x+22$

Chapter 2

6. $-6x+11$
7. $x+30y$
8. 49
9. 8
10. $x=-2$
11. $x=-1$
12. $x=\frac{3}{2}$
13. $x\geq 7$, see graph to right.
14. $x<-4$, see graph to right.
15. $x<-5$, see graph to right.
16. $x>\frac{39}{20}$, see graph to right.
17. $x=36$
18. $x=\frac{16}{3}$
19. The width is 2 inches and the length is 11 inches.
20. The numbers are 6 and 14.
21. $\frac{100}{3}$
22. The integers are -38, -36 and -34.
23. The integers are 18 and 19.
24. Twelve dimes and 13 nickels.
25. Shahin is 30 years old and his sister is 27 years old.
26. $r=\frac{Pv}{nt}$

13.
A number line with a closed dot at 7, shaded to the right; 0 marked.

14.
A number line with a closed dot at $\frac{-40}{11}$, shaded to the left; 0 marked.

15.
A number line with an open dot at -5, shaded to the left; 0 marked.

16.
A number line with an open dot at $\frac{39}{20}$, shaded to the right; 0 marked.

Chapter 3 (for 27-32, see next page)
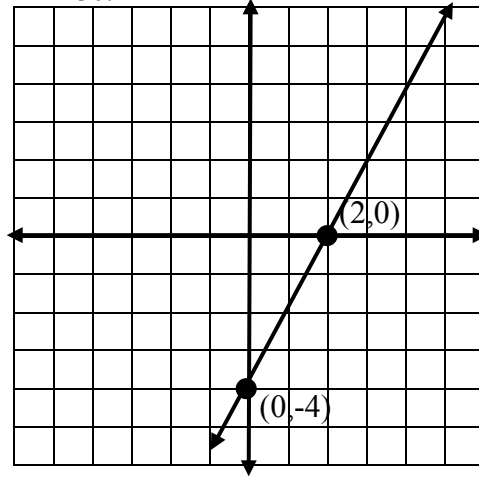
33. $\frac{1}{3}$
34. The slope is $\frac{3}{4}$ and the y-intercept is -3.
35. $-\frac{1}{2}$
36. $y=-12$
37. $y=9$
38. $y=2x-3$
39. $y=-2x-5$
40. $y=-3x-1$

41. $y=\frac{1}{2}x+2$
42. $y=x+2$
43. $y=2x-3$
44. $y=x-2$
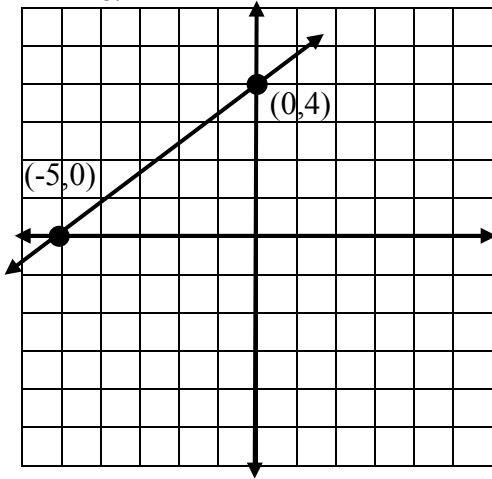45. $y=2x+1$
46. $-\frac{1}{2}$
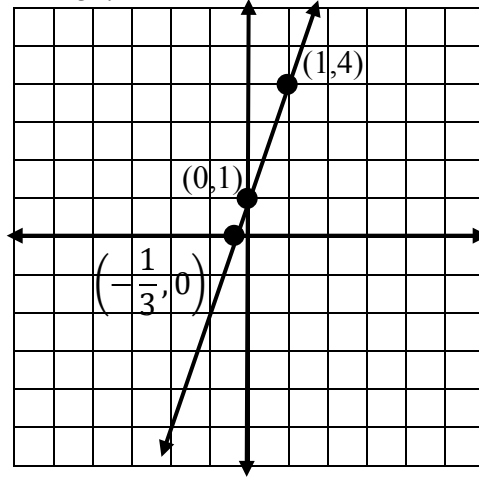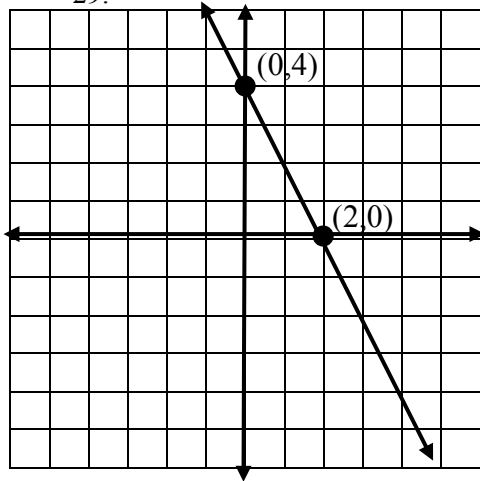
Chapter 3 figures

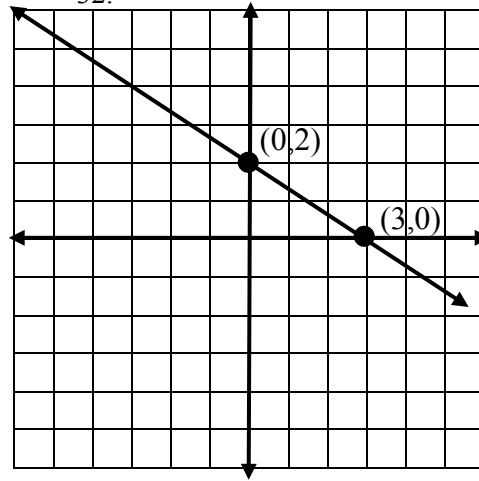27.
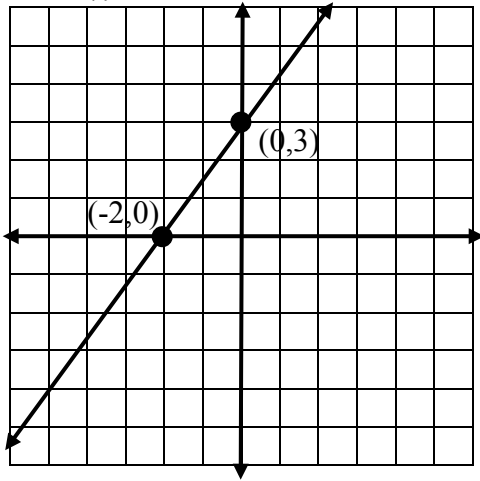
30.

28.

31.

29.

32.

Functional Notation

47. $f(7) = -40$

48. $g(3) = 4\dfrac{1}{3}$

49. $h(5) = \dfrac{1}{7}$

50. $t(8) = 78$

Chapter 4

51. No
52. Yes
53. (-3,-2)
54. (-1,2)
55. (2,2)
56. No solution.
57. There are 85 children and 135 adults
58. There are 9 quarters and 6 dimes.

Chapter 6

64. a. $4z(z - 2)$
   b. $2b(x - 3y + 2z)$
   c. $(4y + 9)(4y - 9)$
   d. $(x - 5)(x + 4)$
   e. $25r^2t^2(r + 4t^3)$

59. The numbers are $\dfrac{11}{2}$ and $\dfrac{19}{2}$.
60. The numbers are 15 and 20.
61. The numbers are 6 and 20.

Chapter 5

62. a. x^5 b. $\dfrac{8}{9y^{22}}$ c. $\dfrac{4t^2}{5r^2}$

63. $24p^3q^5$

64. $-a^2 + 7a$

65. a. $25x^6y^2$
   b. $-x^2y + 3xy$
   c. $2y^5 - 10y^4 + 8y^3$
   d. $4x^3 - 1$
   e. $6x^2 - 7x - 20$
   f. $9 - 24y + 16y^2$
   g. $6x^3 - 5x^2 + 19x - 6$

62. a. 3.46×10^7 b. 5.6×10^{-6}

63. a. 0.00000294 b. $700,000$

   f. $2(5a + 7b)(5a - 7b)$
   g. $(4x + 7)(x - 1)$
   h. $4x^3(x + 4)(x - 4)$
   i. $(x + 3)(x - 3)(x + 2)(x - 2)$
   j. $(x + 4)(3x - 1)(3x + 1)$

Chapter 7

65. a. $\dfrac{1}{x+2}$
   b. $\dfrac{x+5}{x-5}$
   c. $\dfrac{x-1}{3}$
   d. $\dfrac{x-1}{x}$

66. a. $9x$
   b. $\dfrac{x}{x+3}$
   c. $\dfrac{1}{2}$
   d. $\dfrac{x-5}{2x^2(x-3)}$

67. a. $\dfrac{y^2+4}{y-2}$
   b. $\dfrac{12x+35}{7(x+7)}$
   c. $\dfrac{3x^2-2x-6}{3x(x+3)}$
   d. $\dfrac{2x^2+x-5}{x^2-1} = \dfrac{2x^2+x-5}{(x+1)(x-1)}$
   e. $\dfrac{-3x-29}{x^2-2x-24} = \dfrac{-3x-29}{(x-6)(x+4)}$

68. a. $x = -2$
   b. $x = 11$
   c. $x = 11$
   d. $x = 4, x = 2$
   e. $\emptyset$;   ($x = 6$ does not check)
   f. $x = -2$ only; ($x = 3$ does not check)