Math 98 Final Exam Study Guide and Review Problems

Updated by Andrea Hendricks, November 2009

This study guide provides a good review of most of the topics in the course, but do not use it as your only review source. It is best to begin preparing for the final about 10 days in advance. Try studying one or two hours each day by reviewing old tests/quizzes, homework problems, notes, and this study guide. Your exam is 35 - 40 multiple choice questions. Be sure to bring a scantron and your graphing calculator.

The Final Exam covers the following topics:
1. Use algebraic symbols and notation to make meaningful statements
2. Add, subtract, multiply, and divide rational expressions
3. Solve applications for which linear equations, quadratic equations, and linear systems are mathematical models
4. Solve the following equations:
    a. Quadratic with real and non-real solutions
    b. Absolute value of the form: |ax + b| = constant
    c. Rational leading to a quadratic
    d. Polynomial of degree higher than two by factoring
    e. Radical leading to linear or quadratic
5. Solve inequalities, write the solution set in interval notation, and graph the following types:
    a. Factorable quadratic
    b. |ax + b| < or > constant
    c. Factorable polynomial of degree higher than two
6. Solve a system of two linear equations in two variables (having no, one, or many solutions) by graphing, substitution, or elimination
7. Perform operations with complex numbers (excluding division)
8. Apply properties of exponents with integral and rational exponents
9. Perform the four basic operations with radicals (excluding rationalizing)
10. Solve problems where students have to display comprehension of basic geometric concepts including the Pythagorean Theorem, area and perimeter.
11. Perform the following activities with lines:
    a. Use the distance and midpoint formulas
    b. Graph equations in standard form and slope-intercept form
    c. Find the slope of a line
    d. State if lines are parallel or perpendicular
    e. Write the equation of a line
12. Use a graphing calculator
13. Understand function notation
14. Graph parabolas

Some Formulas You Must Know:
1) Slope formula
2) Distance formula
3) Midpoint formula
4) Point-Slope form
5) Slope-Intercept form
6) Fractional exponent
7) Rules of exponents
8) The Quadratic Formula
9) The Pythagorean Theorem
10) Area and Perimeter formulas

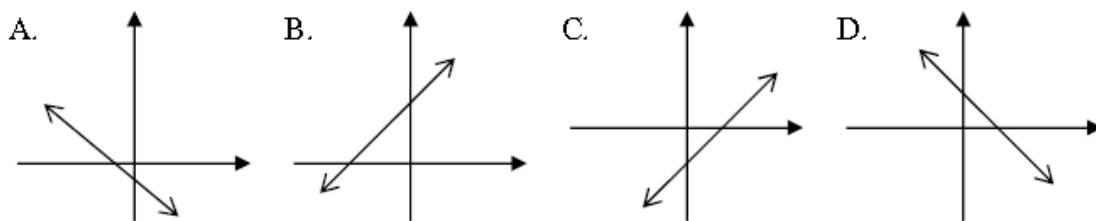✱ 1. $(3x^2)(9x^{-6}) =$ $\quad$ $3 \cdot 9 \cdot x^2 \cdot x^{-6}$ $\quad$ $27x^{-4}$ $\quad$ $\dfrac{27}{7^4}$

A. $\dfrac{x^4}{3}$ $\qquad$ B. $\dfrac{3}{x^4}$ 7^4 $\qquad$ C. $27x^4$ $\qquad$ D. $\dfrac{27}{x^4}$ ⟵

2. $\dfrac{t^{-2}}{t^{-8}} =$ $\quad$ $-2-(-8)= -2+8=6$ $\quad t^6$

A. $\dfrac{1}{t^6}$ $\qquad$ B. $\dfrac{1}{t^{10}}$ $\qquad$ C. t^6 $\qquad$ D. t^{10}

3. The graph that best represents $3x + 2y = 4$ is

A.

B.

C.

D.

4. The slope of the line through $(-2,5)$ and $(-3,-1)$ is

   A. 6   B. $\dfrac{1}{6}$ C. $-\dfrac{1}{6}$ D. -6

5. The slope of the line $5x + 2y = 1$ is

   A. $\dfrac{2}{5}$ B. $-\dfrac{2}{5}$ C. $\dfrac{5}{2}$ D. $-\dfrac{5}{2}$

6. The slope of the line perpendicular to $y = 3x - 4$ is

   A. $\dfrac{1}{3}$ B. $-\dfrac{1}{3}$ C. 3   D. -3

7. The lines $5x - 10y = 1$ and $3y + 1 = 6x$ are
   A. parallel   B. perpendicular   C. neither parallel nor perpendicular

8. The lines $1 - 4x = 10y$ and $15x = 6y + 1$ are
   A. parallel   B. perpendicular   C. neither parallel nor perpendicular

9. The equation of the line with slope -4 through $(-1,-5)$ is
   A. $y = -4x - 9$ B. $y = -4x + 9$ C. $y = 4x + 9$ D. $y = 4x - 9$

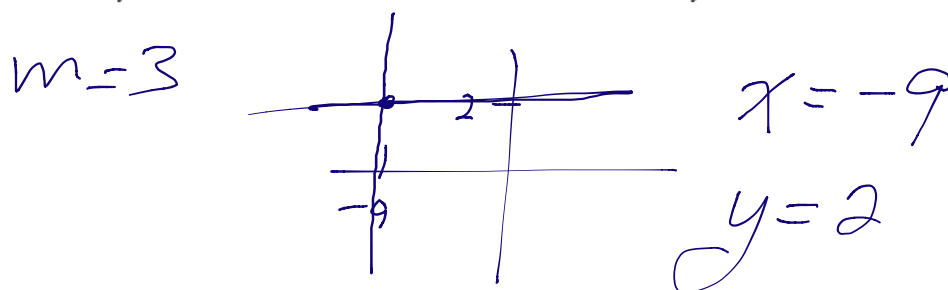10. The equation of the line with $m = -\dfrac{4}{7}$ through $(14,-6)$ is

   A. $y = -\dfrac{4}{7}x + 2$ B. $y = -\dfrac{4}{7}x - 2$ C. $y = \dfrac{4}{7}x + 14$ D. $y = \dfrac{4}{7}x - 14$
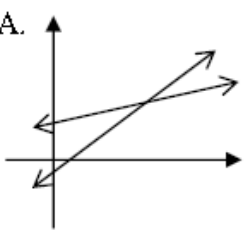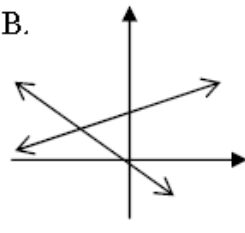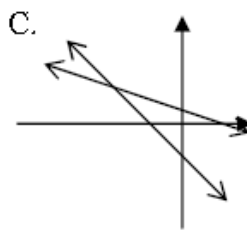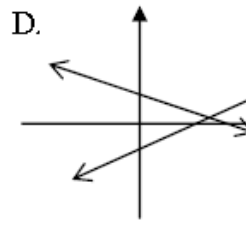
11. The equation of the line through $(2,3)$ and $(4,9)$ is
   A. $y = 3x - 9$ B. $y = 3x - 3$ C. $y = \dfrac{1}{3}x + \dfrac{7}{3}$ D. $y = \dfrac{1}{3}x - \dfrac{11}{3}$

12. The equation of the vertical line through $(-9,2)$ is
   A. $y = 2$ B. $x = 2$ C. $y = -9$ D. $x = -9$

$m = 3$

$x = -9$

$y = 2$

13.   The equation of the line perpendicular to $y = \frac{1}{3}x + 8$ and through $(7,-4)$ is

   A. $y = -3x + 17$ B. $y = -3x + 25$ C. $y = \frac{1}{3}x - \frac{19}{3}$ D. $y = -\frac{1}{3}x - \frac{5}{3}$

14.   The midpoint of the line segment between $(-4,3)$ and $(6,-1)$ is

   A. $(-10,4)$ B. $(2,2)$ C. $(-5,2)$ D. $(1,1)$

15.   The midpoint of the line segment between $(0,-7)$ and $(-5,6)$ is

   A. $\left(-\frac{5}{2},-\frac{1}{2}\right)$ B. $\left(\frac{5}{2},-\frac{13}{2}\right)$ C. $(-5,-1)$ D. $(5,13)$

16.   In 1991 the US population in millions was 252. In 1994 the population was 259 million. Using the ordered pairs (0,252) and (3,259) to represent this data and assuming the population will grow linearly, an equation that would represent this growth is

   A. $y = \frac{7}{3}x + 259$ B. $y = \frac{7}{3}x + 252$ C. $y = \frac{3}{7}x + 259$ D. $y = \frac{3}{7}x + 252$

17.   In 1970, the average teacher's salary at Greenville Academy was $16,000. If the average salary has increased by $900 a year since 1970, in what year will the average teacher's salary reach $35,800?
   A. 1922   B. 1985   C. 1992   D. 2010

18.   If $f(x) = x^2 - x - 5$, then $f(-2)$ is

   A. −11   B. −5   C. −3   D. 1

19.   If $g(x) = -x^2 + 3x$, then $g(4)$ is

   A. −4   B. 4   C. 28   D. 30

20.   The graph that could be used to find the solution to the system $\begin{cases} 5x - 4y = 9 \\ x - 2y = -3 \end{cases}$ is

A.   B.   C.   D.

21.   In the solution of the system $\begin{cases} -5x + 2y = 23 \\ 3x + 2y = -1 \end{cases}$, the x-coordinate is

   A. 4   B. 3   C. −3   D. −4

22. The solution set for the system $\begin{cases} 9x-12y=-81 \\ -3x+4y=27 \end{cases}$ is

  A. $\left(\dfrac{1}{9},0\right)$ B. $\left(0,\dfrac{27}{4}\right)$ C. $\{(x,y)|9x-12y=-81\}$ D. $\varnothing$

23. The system $\begin{cases} 4x+2y=1 \\ 6x+3y=5 \end{cases}$ has

  A. 2 solutions   B. 1 solution   C. no solution   D. infinitely many solutions

24. Tomeka purchased 3 cans of green beans and 2 cans of corn for $2.44. Sandra purchased 5 cans of green beans and 6 cans of corn for $5.64 at the same store. What was the cost of a can of beans?
  A. $1.68   B. $0.59   C. $0.42   D. $0.21

25. $\sqrt[3]{-729}=$
  A. 9   B. $9i$ C. -9 D. $-9i$

26. $-\sqrt{25a^{16}}=$
  A. $5a^4$ B. $-5a^4$ C. $5a^8$ D. $-5a^8$

27. $-\sqrt[4]{16x^{12}}=$
  A. $-2x^3$ B. $2x^3$ C. $4x^3$ D. $-4x^3$

28. $\sqrt{-256}=$
  A. -16 B. 16   C. $-16i$ D. $16i$

29. The best approximation for $\sqrt[3]{12,516}$ is
  A. 3.849   B. 1788   C. 111.875   D. 783.125

30. $625^{\frac{3}{4}}=$
  A. 15   B. 25   C. 125   D. 5

31. $4^{\frac{3}{5}} \cdot 4^{\frac{7}{5}}=$
  A. 8   B. 16   C. 256   D. 4

32. $\dfrac{16^{-\frac{5}{4}}}{16^{\frac{3}{4}}}=$

  A. 8   B. 4   C. $\dfrac{1}{8}$ D. $\dfrac{1}{4}$

33. $(32k^{10})^{\frac{1}{5}} =$

A. $2k^2$ B. $32k^2$ C. $32k^{50}$ D. $2k^{50}$

34. The distance between the points $(3,-4)$ and $(0,7)$ is

A. $\sqrt{130}$ B. $\sqrt{31}$ C. $\sqrt{14}$ D. $3\sqrt{2}$

35. The distance between the points $(-1,-5)$ and $(2,-6)$ is

A. $\sqrt{2}$ B. $\sqrt{10}$ C. $\sqrt{122}$ D. $\sqrt{130}$

36. $\sqrt{75} - \sqrt{12} + \sqrt{27} =$

A. $\sqrt{60}$ B. $10\sqrt{3}$ C. $2\sqrt{15}$ D. $6\sqrt{3}$

37. $(\sqrt{5}-1)(2\sqrt{5}+7) =$

A. $-7+7\sqrt{5}$ B. $3-5\sqrt{5}$ C. $3+5\sqrt{5}$ D. $-7-5\sqrt{5}$

38. $(4\sqrt{3}-6\sqrt{2})^2 =$

A. $120-24\sqrt{6}$ B. $120-48\sqrt{6}$ C. 120 D. $48-48\sqrt{6}$

39. $\dfrac{5\sqrt{12}}{10\sqrt{2}} =$

A. $\sqrt{3}$ B. $\dfrac{\sqrt{6}}{2}$ C. 3 D. 12

40. The solution set of $\sqrt{m^2+5m-8} = m+1$ is

A. $\{3\}$ B. $\left\{\dfrac{9}{5}\right\}$ C. $\{-3\}$ D. $\{2\}$

41. The solution set of $\sqrt{x+6} = x$ is

A. $\{-2,3\}$ B. $\{-2\}$ C. $\{3\}$ D. $\varnothing$

42. The solution set of $\sqrt{2x+13} + x = 1$ is

A. $\{-6,2\}$ B. $\{-2\}$ C. $\{-2,6\}$ D. $\varnothing$

43. $(8+3i)-(6-2i)=$

    A. $2-5i$ B. $2-i$ C. $2+5i$ D. $14+i$

44. $3i(5+2i)-4i=$

    A. $-6+11i$ B. $-6+4i$ C. $5i$ D. $17i$

45. The solution set of $3a^2-26a=9$ is

    A. $\left\{\dfrac{1}{3},9\right\}$ B. $\left\{-9,-\dfrac{1}{3}\right\}$ C. $\left\{-9,\dfrac{1}{3}\right\}$ D. $\left\{-\dfrac{1}{3},9\right\}$

46. The solution set of $21y^2=y+10$ is

    A. $\left\{\dfrac{2}{3},\dfrac{5}{7}\right\}$ B. $\left\{-\dfrac{5}{7},-\dfrac{2}{3}\right\}$ C. $\left\{-\dfrac{5}{7},\dfrac{2}{3}\right\}$ D. $\left\{-\dfrac{2}{3},\dfrac{5}{7}\right\}$

47. The solution set of $q^2-9q=0$ is

    A. $\{0,9\}$ B. $\{0,-9\}$ C. $\{-3,3\}$ D. $\{0,3\}$

48. The solution set of $w^2=128$ is

    A. $\left\{\pm 2\sqrt{8}\right\}$ B. $\left\{\pm 8\sqrt{2}\right\}$ C. $\left\{\pm 8\sqrt{3}\right\}$ D. $\left\{\pm 4\sqrt{5}\right\}$

49. The solution set of $(2m+3)^2=7$ is

    A. $\left\{\dfrac{-3\pm\sqrt{7}}{2}\right\}$ B. $\left\{\dfrac{3\pm\sqrt{7}}{2}\right\}$ C. $\left\{\dfrac{2\pm\sqrt{7}}{3}\right\}$ D. $\left\{\dfrac{-2\pm\sqrt{7}}{3}\right\}$

50. The term that must be added to x^2+14x to make it a perfect trinomial square is

    A. 2401 B. 196 C. 7 D. 49

51. The solution set of $3q^2=4q-2$ is

    A. $\left\{\dfrac{2\pm 2i\sqrt{2}}{3}\right\}$ B. $\left\{\dfrac{2\pm i\sqrt{2}}{3}\right\}$ C. $\left\{\dfrac{2\pm\sqrt{2}}{3}\right\}$ D. $\left\{\dfrac{2+2\sqrt{2}}{3}\right\}$

52. The solution set of $5x^2-x=1$ is

    A. $\left\{\dfrac{1\pm\sqrt{19}}{10}\right\}$ B. $\left\{\dfrac{-1\pm i\sqrt{19}}{10}\right\}$ C. $\left\{\dfrac{1\pm i\sqrt{21}}{10}\right\}$ D. $\left\{\dfrac{1\pm\sqrt{21}}{10}\right\}$

53. The approximate solutions of $2x^2-7x+1=0$ are

    A. $\{0.1492,3.3508\}$ B. $\{-3.3508,-0.1492\}$

    C. $\{-4.6531,8.1531\}$ D. $\{0.0729,3.4271\}$

54. If the discriminant of a quadratic equation is 27, then the number and type of solutions are

    A. 2 imaginary   B. 1 real   C. 2 real rational   D. 2 real irrational

55. The solution set of $\dfrac{x}{2} - \dfrac{4}{x} = -\dfrac{7}{2}$ is

    A. $\{-1, 8\}$ B. $\{-8\}$ C. $\{-8, 1\}$ D. $\varnothing$

56. The solution set of $\dfrac{x-4}{x-3} + \dfrac{x-2}{x-3} = x - 3$ is

    A. $\{3, 5\}$ B. $\{5\}$ C. $\{-1, 3\}$ D. $\left\{1 \pm i\sqrt{14}\right\}$

57. The solution set of $m^4 - 2m^2 = 35$ is

    A. $\left\{\pm\sqrt{5}, \pm i\sqrt{7}\right\}$ B. $\{\pm 5, \pm 7\}$ C. $\{-5, 7\}$ D. $\left\{\pm\sqrt{7}, \pm i\sqrt{5}\right\}$

58. The solution set of $x^4 + 9x^2 + 20 = 0$ is

    A. $\left\{\pm 2, \pm\sqrt{5}\right\}$ B. $\left\{\pm 4, \pm\sqrt{5}\right\}$ C. $\{\pm 2, \pm 5\}$ D. $\left\{\pm 2i, \pm i\sqrt{5}\right\}$

59. A dog pen is in the shape of a right triangle. The longer leg measures 15 feet. The hypotenuse is 7 feet shorter than three times the length of the shorter leg. How long is the shorter leg?

    A. $2\dfrac{3}{4}$ feet   B. 8 feet   C. 17 feet   D. 64 feet

60. A bottle rocket is launched upward from the ground with an initial velocity of 64 ft. per second. The rocket's height measured in feet above the ground is given by $h(t) = 64t - 16t^2$ where t is the number of seconds after launch. When does the rocket hit the ground?

    A. 1 second   B. 4 seconds   C. 16 seconds   D. 64 seconds

61. The vertex of the parabola $y = (x-1)^2 + 3$ is

    A. $(1, 3)$ B. $(-1, 3)$ C. $(1, -3)$ D. $(-1, -3)$

62. The solution set of $x^2 - 5x < 0$ is

    A. $(0, 5)$ B. $(-5, 0)$ C. $(-\infty, 0) \cup (5, \infty)$ D. $(-\infty, -5) \cup (0, \infty)$

63. The solution set of $x^2 + 10 \geq 7x$ is

    A. $[2, 5]$ B. $(-\infty, 2] \cup [5, \infty)$ C. $[-5, -2]$ D. $(-\infty, -5] \cup [-2, \infty)$

64.   The solution set of $(x+3)(x-3)(x-1)(x+1) \leq 0$ is

   A. $(-\infty,-3]\cup[-1,1]$ B. $[-3,-1]\cup[1,3]$ C. $[-1,1]\cup[3,\infty)$ D. $(-\infty,-3]\cup[3,\infty)$

65. $(x-4)(x+1)(x-9) \geq 0$

   A. $[-9,-4]\cup[1,\infty)$ B. $(-\infty,-9]\cup[-4,1]$ C. $[-1,4]\cup[9,\infty)$ D. $(-\infty,-1]\cup[4,9]$

66.   The solution set of $|t+2|=4$ is

   A. $\{2\}$ B. $\{-6\}$ C. $\{-6,2\}$ D. $\varnothing$

67.   The solution set of $|2d-4|+6=8$ is

   A. $\{3\}$ B. $\{1\}$ C. $\{1,3\}$ D. $\varnothing$

68.   The solution set of $\left|7-\dfrac{1}{2}x\right|=-3$ is

   A. $\{20\}$ B. $\{8\}$ C. $\{8,20\}$ D. $\varnothing$

69.   The solution set of $|x-5|\leq 8$ is

   A. $[13,\infty)$ B. $[-3,13]$ C. $(-\infty,-3]\cup[13,\infty)$ D. $(-\infty,13]$

70.   The solution set of $|7-2x|>1$ is

   A. $(-\infty,3)\cup(4,\infty)$ B. $(3,4)$ C. $(3,\infty)$ D. $(-\infty,-3)\cup(4,\infty)$

71. Find the value of $\dfrac{5-8x}{8x^2+4x-1}$ when $x = -3$.

   A. $\dfrac{29}{83}$ B. $-\dfrac{19}{83}$ C. $-\dfrac{19}{59}$ D. $\dfrac{29}{59}$

72. The expression $\dfrac{m-5}{4-m}$ is undefined for the values

   A. No values   B. $m=4,5$ C. $m=4$ D. $m=-4$

73. When written in lowest terms, $\dfrac{y^2+4y-32}{y^2+3y-40}$ becomes

   A. $\dfrac{4y-4}{3y-5}$ B. $-\dfrac{y^2+4y-32}{y^2+3y-40}$ C. $\dfrac{y-4}{y-5}$ D. $\dfrac{4y-32}{3y-40}$

74. When completely simplified, $\dfrac{4p - 4}{p} \cdot \dfrac{8p^2}{7p - 7}$ is

    A. $\dfrac{32p}{7}$ B. $\dfrac{28p^2 + 56p + 28}{8p^3}$

    C. $\dfrac{7}{32p}$ D. $\dfrac{32p^3 - 32p^2}{7p^2 - 7p}$

75. When completely simplified, $\dfrac{8r - 24s}{3r - 6s} \div \dfrac{12s - 4r}{2r - 4s}$ is

    A. $-\dfrac{4}{3}$ B. $\dfrac{4}{3}$ C. $-\dfrac{3}{4}$ D. $\dfrac{3}{4}$

76. The LCD of the fractions $\dfrac{13}{9y^5}$ and $\dfrac{19}{15y^2}$ is

    A. $45y^7$ B. $19y^7$ C. $9y^5$ D. $45y^5$

77. The LCD of the fractions $\dfrac{2}{8a + 72}$ and $\dfrac{3}{a^2 + 9a}$ is

    A. $8a(a + 9)$ B. $8a^2 + 72$ C. $8a^2 + 9$ D. $8a + 9$

78. When completely simplified, $\dfrac{2a + 3}{4a - 5} - \dfrac{a - 2}{4a - 5}$ is

    A. $\dfrac{a + 1}{4a - 5}$ B. $a + 5$ C. $\dfrac{a + 5}{4a - 5}$ D. $a - 1$

79. When completely simplified, $\dfrac{3}{r} + \dfrac{9}{r - 3}$ is

    A. $\dfrac{9r - 12}{r(r - 3)}$ B. $\dfrac{12r - 9}{r(3 - r)}$ C. $\dfrac{12r - 9}{r(r - 3)}$ D. $\dfrac{9r - 12}{r(3 - r)}$

80. When completely simplified, $\dfrac{6}{x - 3} + \dfrac{9}{3 - x}$ is

    A. $\dfrac{15}{x - 3}$ B. $\dfrac{54}{x - 3}$ C. $\dfrac{3}{x - 3}$ D. $\dfrac{-3}{x - 3}$

81. The solution set of $\dfrac{x^2}{x+1} - 4 = \dfrac{1}{x+1}$ is

    A. {-1, 5}   B. ∅   C. {5}   D. {-1}

82. The solution set of $\dfrac{2}{t} = \dfrac{t}{4t-6}$ is

    A. {2, 6}   B. {0, 6}   C. {0, 36}   D. ∅

83. The solution set of $\dfrac{5}{m-2} - \dfrac{8}{m+2} = \dfrac{2}{m^2-4}$ is

    A. {-8}   B. {8, -8}   C. {8}   D. ∅

Answers to the Math 98 Exam Review

1. D	15. A	29. A	43. C	57. D	71. D
2. C	16. B	30. C	44. A	58. D	72. C
3. D	17. C	31. B	45. D	59. B	73. C
4. A	18. D	32. D	46. D	60. B	74. A
5. D	19. A	33. A	47. A	61. A	75. A
6. B	20. A	34. A	48. B	62. A	76. D
7. C	21. C	35. B	49. A	63. B	77. A
8. B	22. C	36. D	50. D	64. B	78. C
9. A	23. C	37. C	51. B	65. C	79. C
10. A	24. C	38. B	52. D	66. C	80. D
11. B	25. C	39. B	53. A	67. C	81. C
12. D	26. D	40. A	54. D	68. D	82. A
13. A	27. A	41. C	55. C	69. B	83. C
14. D	28. D	42. B	56. B	70. A	