

Math 840 TIPS FOR THE FINAL

Course Learning Objectives:

- 1) Translate words into algebraic expressions, equations, and inequalities.
- 2) Identify and use the properties of real numbers and classify numbers into appropriate subsets.
- 3) Simplify expressions: numerical and polynomial.
- 4) Solve: linear, literal, quadratic and 2×2 systems of equations and linear inequalities.
- 5) Solve applications using the equations and inequalities from Objective 4.
- 6) Use laws of exponents to simplify expressions with integer exponents.
- 7) Identify and use connections between linear equations, their slope, their intercepts, and their graphs.
- 8) Identify functions and their domains and ranges; Evaluate functions using proper notation.

There are about 44 problems on the final test, 18 of which are multiple choice. Please bring your scientific calculator, pens, #2 pencils, erasers and ruler (optional) for the final. Scratch paper will be provided and must be turned in with the test. You are not allowed to use notes or talk to any other students during the test.

THE FOLLOWING ACTIVITIES WILL HELP YOU PREPARE FOR THE FINAL.

- 1) Review any notes made while working on your homework.
- 2) Re-work some of the assigned homework and quiz problems: especially those from the beginning of the course and those you originally had trouble with.

BY DOING THIS, YOU WILL DISCOVER WHERE YOU NEED EXTRA HELP.

- 3) Find the sections in your book that cover the material. and do more problems.
- 4) Get help in the Math Learning Center.

GOOD PREPARATION WILL BOOST YOUR SELF – CONFIDENCE.

REMINDERS: Many errors can be avoided by proofreading your work when you finish. Before you turn your test in, look through for the following common errors.

- 1) **READ THE DIRECTIONS CAREFULLY AND FOLLOW THEM.**
- 2) Simplify the answers completely: reduce all fractions, do all possible calculations.
- 3) Be sure to follow all steps for solving word problems as shown in your text and in class. Answer all parts of the question with complete sentences.
- 4) Look for sign and simple calculation errors.
- 5) Use the proper mathematical language when answering:
 - “undefined” is the proper term for division by zero as in $5 \div 0$, 0^0 , and the slope of a vertical line
 - “no solution” is the proper answer when asked to “solve” an equation that is a contradiction
- 6) There should be no negative exponents in answers unless the answer is in scientific notation.
- 7) Know your geometric formulas and the three methods for graphing equations of lines.
- 8) Always be aware of what you are working with:
 - Equations are solved.
 - Expressions can be simplified, evaluated or have the form changed.

The following problems will show some of the differences between equations and expressions.

SIMPLIFY EXPRESSIONS

1. Simplify the polynomials : **Note:** Do not clear fractions from expressions!

a. $\frac{1}{2}x + \frac{2}{3}y + \frac{1}{2}x - \frac{3}{4}y$

b. $(x^2 - 5) - (2x^2 - x - 3)$

2. Simplify (using laws of exponents) :

a. 2^0

b. $2a^0$

c. $(-5)^2$

d. $-5a^{-2}$

e. -5^2

f. $(-a^2b^{-3})^2$

g. $\frac{-6a^2b^{-4}}{12a^3b^3}$

3. Evaluate: Use $x = -3$ and $y = 5$

a. $(x + y)^{-2}$

b. $x^{-2} + y^{-2}$

4. Factor completely :

a. $x^2 - 25y^4$

b. $5x^2 + 125y^4$

c. $2m^4 - 32$

d. $10x^2 + 11x - 6$

e. $36x^3y^2 - 42xy^5 - 24x^7y^3$

f. $xy + 2y - 5x - 10$

5. Divide:

a. $(x^3 - 3x^2 + 2x - 4) \div (x - 3)$

b. $(x^4 - 2x^2 + 2) \div (x + 1)$

SOLVING EQUATIONS

6. Solve each equation. Remember that you must check potential solutions on radical equations. No squaring in the check. Checks on linear equations and quadratic equations are optional, but encouraged.

a. $\frac{1}{3}m - m = \frac{3}{5}$

b. $\frac{p+3}{5} - \frac{p-4}{2} = 2$

c. $5m - 3(m + 2) = 2(m - 3)$

d. $3p - 5(p + 1) = -2(p + 1)$

e. $(x + 5)(2x + 3) = -5$

ANSWERS:

1a. $x - \frac{1}{12}y$

1b. $-x^2 + x - 2$

2a. 1

2b. 2

2c. 25

2d. $\frac{-5}{a^2}$

2e. -25

2f. $\frac{a^4}{b^6}$

2g. $\frac{-1}{2a^3b^7}$

3a. $\frac{1}{4}$

3b. $\frac{34}{225}$

4a. $(x - 5y^2)(x + 5y^2)$

4b. $5(x^2 + 25y^4)$

4c. $2(m - 2)(m + 2)(m^2 + 4)$

4d. $(5x - 2)(2x + 3)$

4e. $6xy^2(6x^2 - 7y^3 - 4x^6y)$

4f. $(y - 5)(x + 2)$

5a. $x^2 + 2 + \frac{2}{x-3}$

5b. $x^3 - x^2 - x + 1 + \frac{1}{x+1}$

6a. $\frac{-9}{10}$

6b. 2

6c. all real numbers

6d. no solution

6e. $-\frac{5}{2}, -4$

Organizing the Material

It will be best for you if you can organize the topics. Look for similarities and differences in the questions or directions and the methods. Try to group topics that use similar methods or have the same instructions.

EXPRESSIONS

REMEMBER: Simplify, evaluate, change the form. **DO NOT SOLVE.**

SIMPLIFY: (may also say “perform the indicated operations”)

Order of operations: 1) $(5 - 7)^4 \div (-1)(2) - 4(-1)$

Laws of exponents: 2) $\frac{(-3a^2b^{-3})^{-2}}{(a^4b^{-1})^{-3}}$ 3) $3x^{-2}$

Polynomials: 4) $(x^2 + 2) - (-3x^2 - 5)$ 5) $(x + 3)(x^2 - 3x + 2)$

EVALUATE: Remember to put () around the value when substituting for the variable.

Order of operations: 6) $3x^2 - 2x - 5$; $x = -3$

Laws of exponents: 7) $x^{-1} - y^{-2}$; $x = 3$, $y = -2$

Polynomials: 8) $x^2 - 5x - 7$; $x = -2$

CHANGE THE FORM:

Laws of exponents: 9) Convert 0.522×10^{-8} to scientific notation

Polynomials: 10) **Factor:** $162x^6 - 32x^2y^4$

11) **Factor:** $5x^3y^4 - 15xy^3 + 30x^2y$

12) **Factor:** $25x^2(a + b) - 36(a + b)$

ANSWERS: 1) -28 2) $\frac{a^8b^3}{9}$ 3) $\frac{3}{x^2}$ 4) $4x^2 + 7$ 5) $x^3 - 7x + 6$

6) 28 7) $\frac{1}{12}$ 8) 7

9) 5.22×10^{-9} 10) $2x^2(9x^2 + 4y^2)(3x + 2y)(3x - 2y)$ 11) $5xy(x^2y^3 - 3y^2 + 6x)$

12) $(a + b)(5x + 6)(5x - 6)$

EQUATIONS

Equations are solved. There are various types of equations with different methods of solving.

- LINEAR:** 13) $\frac{2}{3}x + \frac{1}{2} = -\frac{3}{4}x - 2$
- SPECIAL CASES:** 14) $2(y + 3) = 3y - (y - 6)$ 15) $5m - 2 = 5(m + 1)$
- LITERAL:** 16) $x = a(m - n)$ for "n"
- QUADRATIC:** 17) $m(m - 1) = 6$ 18) $5x = 2x^2$

FACT RECOGNITION

Some questions may refer to mathematical definitions or recognition of facts.

- 19) Which of the following numbers are **integers**? $\frac{1}{2}, 3, -2, 0, 3.2, \sqrt{16}, \sqrt{21}$
- 20) Which of the following numbers are **rational**? $3\pi, \sqrt{18}, \sqrt{64}, 3.14, 0, -2, -\frac{5}{7}$
- 21) What **property** is being illustrated? $\left(-\frac{1}{3} + 3\right) \cdot 1 = 1 \cdot \left(-\frac{1}{3} + 3\right)$
- 22) What is the slope and the y-intercept of the line whose equation is $y = \frac{3}{5}x - 3$?
- 23) Is $(2, -3)$ a solution to $2x - y - 7 = 0$?
- 24) What are the three methods we use to factor polynomials?
- 25) Give the equation of a line parallel to the y-axis and 3 units to the left of it.
- 26) What is the slope of the line in #25?

GRAPHING/EQUATIONS OF LINES

- 27) Find the x-intercept and the y-intercept of the following equation and use it to graph:
 $2x + 3y + 9 = 0$
- 28) Find the y-intercept and the slope of the following equation and use them to graph the solutions.
 $3x - 5y = 30$
- 29) Find the equation of the line with a slope of $-\frac{3}{5}$ that passes through the point $(5, -6)$.
- 30) Find the equation of a line through the point $(3, -2)$ that is perpendicular to the line $3x - 5y = 15$
- 31) Find the equation of the line through $(2, 5)$ and $(4, -2)$ and put in slope-intercept form.

- ANSWERS:** 13) $x = -\frac{30}{17}$ 14) all real numbers 15) no solution 16) $n = \frac{a \cdot m - x}{a}$
- 17) $m = -2$ or 3 18) $x = 0$ or $\frac{5}{2}$ 19) $3, -2, 0, \sqrt{16}$ 20) $\sqrt{64}, 3.14, 0, -2, -\frac{5}{7}$
- 21) Commutative Property of Multiplication 22) slope = $\frac{3}{5}$, y-int = $(0, -3)$ 23) yes
- 24) Greatest Common Factor, Reverse Foil, Difference of squares, (4th method is Grouping) 25) $x = -3$
- 26) The slope of a vertical line is undefined. 27 & 28) Answers on back side of handout after #70
- 29) $y = -\frac{3}{5}x - 3$ 30) $5x + 3y = 9$ or $y = -\frac{5}{3}x + 3$ 31) $y = -\frac{7}{2}x + 12$

Applications

- 32) When the difference between a number and 2 is multiplied by -7, the result is one more than -10 times the number. Find the number.
- 33) A student has taken twice as many math classes as English classes and $\frac{1}{2}$ as many science classes as English classes. If the student has taken 7 classes, how many math classes has the student taken?
- 34) Find the measure of an angle whose supplement measures 20° less than 3 times the measure of its complement.
- 35) Find two consecutive even integers such that three times the first subtracted from four times the second is 26.
- 36) How many gallons of 40% antifreeze must be mixed with 50 gallons of a 70% solution to get a mixture which is 50% antifreeze?
- 37) If \$10,000 is invested part at 7% and part at 9% simple interest and if the total annual return is \$840, how much was invested at 7%?
- 38) A collection of coins consists of quarters and dimes. The total value of the collection is \$6.00. The number of dimes is four more than the number of quarters. How many dimes are in the collection?
- 39) Homer Simpson recently bought a house for \$153,000. He expects to earn 9% per year on the purchase price. How many dollars per year will he earn?
- 40) If the sale price of a book is \$10.92 after a reduction of 35%, what is the original price of the book?
- 41) Mary pushes a baby stroller at 3 miles per hour and Jill pulls a red wagon at 2 miles per hour. If they start at the same point, and travel in opposite directions, how long will it take them to be 8 miles apart?
- 42) The perimeter of a given square is 5 centimeters more than 3 times the length of a side. Find the length of a side.
- 43) Amy has scores of 87, 84, 95, and 92 on four quizzes. What possible scores can she make on the fifth quiz to have an average of at least 90 after five quizzes?
- 44) The base of a triangle is 7 centimeters. The area must be at least 42 square centimeters. Find the possible values for the height of the triangle.
- 45) The length of a rectangle is 2 inches longer than the width. The area of the rectangle is numerically 11 more than the perimeter. Find the width of the rectangle.
- 46) The hypotenuse of a right triangle is 1 inch longer than twice the shorter leg, while the longer leg is 1 inch shorter than twice the shorter leg. Find the lengths of the three sides of the triangle.
- 47) A ladder is set against a wall so that the top of the ladder is four feet further from the ground than the bottom of the ladder is from the house. If the length of the ladder is 8 feet shorter than the sum of the distance from the house to the ladder and from the ground to the top of the ladder, find the length of the ladder.
- 48) A rock is thrown from the top of a cliff 48 ft high. The height h of the ball after t seconds is given by the equation: $h = -16t^2 + 32t + 48$. If the rock does not hit the cliff on the way down, when will the rock hit the ground? (Remember, the ground is height $h = 0$).

Solve the following inequality and then show the solution on a graph.

49) $4x - (6x + 1) \leq 8x + 2(x - 3)$

Functions

50) Find the following if $f(x) = -x^2 - 2x + 1$:

- a) $f(-3)$ b) $f(0)$ c) $f(2)$ d) $f(c)$ e) $2f(b)$ f) $3f(m) - 1$

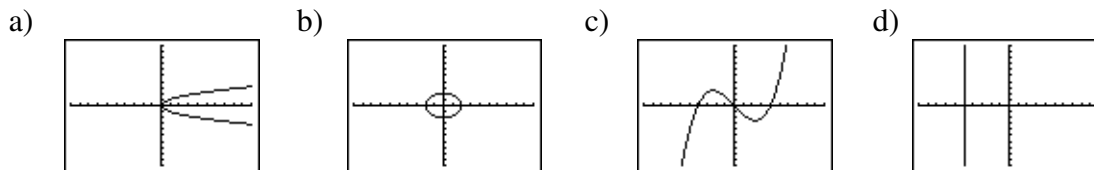
51) Find the domain and range of the function $f(x) = 2 + 3x$.

52) Find the domain of $f(x) = \frac{3}{x+1}$

53) Let g be the function $g = \{(-2, 1), (-1, 2), (0, 0), (1, 1), (2, 2)\}$. Then the range of g is:

- a) $\{-2, -1, 0, 1, 2\}$ b) $\{0, 1, 2\}$ c) $[-2, 2]$ d) $[0, 2]$ e) none of these

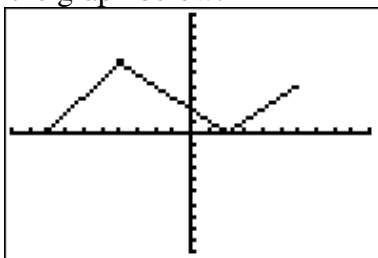
54) Which of the following is the graph of a function:



55) Let g be the function $g = \{(2, 3), (3, 4), (4, 5), (5, 3), (6, 7)\}$. Then $g(5) =$

- a) 3 b) 4 c) 6 d) $g(5)$ is undefined e) $\{2, 3, 4, 5, 6\}$

56) Let f be the graph below:



- a) Find $f(2)$ b) Find the domain of f c) Find the range of f

57) The value of a car bought in 2000 depreciates, or decreases, as time passes. Two years after the car was bought, it was worth \$12500; 10 years after it was bought, it was worth \$750.

- a. Write two ordered pairs that can be used to represent this data.
Let x represent the number of years **after** 2000.
- b. Write the **linear function** that models this data.

Systems of Equations

$$\begin{aligned} 58) \quad 2x - 5y &= 12 \\ x + 4y &= 6 \end{aligned}$$

$$\begin{aligned} 59) \quad 2x - 3y &= 4 \\ 6x - 9y &= 15 \end{aligned}$$

$$\begin{aligned} 60) \quad \frac{1}{2}x - 3y &= 1 \\ -x + 6y &= -2 \end{aligned}$$

61) Eight flats of impatiens and two flats of marigolds cost \$15.50. Three flats of impatiens and five flats of marigolds cost \$10.02. Find the price per flat of each kind of flower.

ANSWERS: Remember to use the all steps when answering word problems.

32) $\frac{-13}{3}$ 33) 4 34) 35° 35) 18,20 36) 100 37) \$3000 368) 20 dimes

39) \$13,770 40) \$16.80 41) 1.6 hrs. 42) 5 cm 43) At least 92

44) At least 12 cm. 45) 5 in. 46) 8, 15, 17 in. 47) 20 feet 48) 3 secs.

49) $x \geq \frac{5}{12}$ Interval Notation: $[\frac{5}{12}, \infty)$

50a) -2 50b) 1 50c) -7 50d) $-c^2 - 2c + 1$

50e) $-2b^2 - 4b + 2$ 50f) $-3m^2 - 6m + 2$

51) D: $(-\infty, \infty)$ R: $(-\infty, \infty)$ 52) $(-\infty, -1) \cup (-1, \infty)$

53) b 54) c 55) a

56a) 0 56b) $[-8, 6]$ 56c) $[0, 6]$

57) a) (2, 12,500) (10,750) b) $f(x) = -1468.75x + 15437.5$

58) (6,0) 59) No solution 60) $\{(x,y): -x + 6y = -2\}$

61) \$1.69 is the price of the impatiens per flat; \$0.99 is the price of the marigolds per flat.

ANSWERS for 27-28:

27) x-intercept = $(-4\frac{1}{2}, 0)$ y-intercept = (0, -3) 28) y-intercept = (0, -6) slope = $\frac{3}{5}$

