

California State University, Sacramento

Department of Mathematics and Statistics

# Diagnostic Tests Study Guide

**Descriptions**

**Study Guides**

**Sample Tests & Answers**

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## Introduction

Some classes at CSUS require that you pass a mathematics diagnostic test in order to remain enrolled in the class. The diagnostic test determines if you have the basic math skills necessary to be successful in that class. This study guide has been developed to help you review for the particular test you need to take.

There are 3 diagnostic test study guides in this booklet. The Intermediate Algebra Test (IAD) assumes you can easily do the math in the Elementary Algebra (with Geometry) Diagnostic Test (EGAD), and the Calculus Readiness Diagnostic Test (CR) assumes you can easily do the math in both the EGAD and IAD Tests. So, you should review the diagnostic test (s) below the one you need to pass for your class.

<b>To stay in this Math Class:</b>	<b>Take this Diagnostic Test:</b>
Math 9, 11	<b>EGAD or IAD</b>
Math 17 Math 24 Math 26A Math 29 Math 107A Statistics 1	<b>IAD</b>
Math 30	<b>CR</b>

## **Elementary Algebra (with Geometry) Diagnostic Test (EGAD)**

The Elementary Algebra (with Geometry) Diagnostic Test (EGAD) is given by the Learning Skills Department at the end of LS 7B and LS 10. There are 45 multiple choice questions and the test is 60 minutes long.

The following is a list of Elementary Algebra topics covered on the EGAD. After that is an EGAD Sample Test with Answers. If you find a section of the sample test questions difficult, use the topics list to help you find a similar section in an Elementary Algebra textbook. Then read and study the textbook until you understand how to do those problems.

**This is also a good Sample Test to take when preparing for the IAD!**

### **Study Guide: Elementary Algebra Diagnostic Test**

#### Topic I – Arithmetic Operations

- Arithmetic operations with fractions and decimals
- Integral exponents and square roots of perfect squares
- Conversion between fractions and decimals
- Ordering of rational numbers
- Percentages
- Estimation and approximation

#### Topic II – Polynomials

- Simplification and evaluation of polynomials
- Basic operations with polynomials
- Special products
- Factoring—monomial factors, trinomials, and special products

#### Topic III – Linear Equations and Inequalities

- Solving linear equations with numerical and literal coefficients
- Solving equations reducible to linear equations
- Solving linear inequalities
- Solving two linear equations by elimination and substitution

#### Topic IV – Quadratic Equations

- Solution of quadratic equations by factoring

## Topic V – Graphing

- Graphing points on the number line and in the coordinate plane
- Graphs of linear inequalities
- Inequalities in one unknown
- Graphs of simple linear equations
- Slope of a line

## Topic VI – Rational Expressions

- Simplification of rational expressions
- Addition and Subtraction of rational expressions
- Multiplication and Division of rational expressions
- Complex rational expressions

## Topic VII – Exponents and Square Roots

- Exponentiation with integral exponents
- Simplification, addition, subtraction, multiplication, and division of square roots
- Scientific notation

## Topic VIII – Geometric Measurement

- Measurement formulas for perimeter, circumference, area, and volume of triangles, squares, rectangles, parallelograms, circles, cubes, rectangular solids, cylinders, and spheres
- Sum of the interior angles of a triangle
- Properties of isosceles triangles
- Properties of similar triangles
- Pythagorean Theorem

## Topic IX – Word Problems

- Problems involving arithmetic, percent, average, algebraic substitution, evaluation, ratio, and proportion
- Problems leading to one and two linear equations
- Problems from geometry

## Elementary Algebra (with Geometry) Diagnostic Sample Test Questions

### Topic I – Arithmetic Operations

1. Express  $\frac{7}{15}$  as a decimal exactly and rounded to the thousandths place.
2. Simplify:  $\left(\frac{5}{8} + \frac{3}{4}\right) \div 11$
3.  $3 - (2 - 4.17 + .003) =$
4. Write  $(2^3)^5 \cdot 2$  as a power of 2.

### Topic II – Polynomials

5. Multiply:  $5ab^2(2a^2b^3 - 11a + 3)$
6. Factor completely:  $9a^2 - 25b^2$
7. Solve for x:  $(x + 6)(2x - 5) = 0$
8. If  $x = 2$  and  $y = -3$ , then  $x^2y^3 - 3xy + 4x^2 =$
9. Multiply and simplify:  $(2x - 5y)^2$
10. Factor completely:  $3a^2 - 7a - 6$
11. Simplify:  $(2m^2 - m + 1) - (m^2 - 3m - 1)$
12. Multiply and simplify:  $(w + 4)(v - 1) - 3w(v + 2)$
13. Factor completely:  $15a^3b^2z^5 - 9ab^3z^2 + 24a^2b^3z^3$

### Topic III – Linear Equations and Inequalities

14. Solve for x:  $\frac{2x + 7x}{7} = 5 + 2x$
15. Solve for x:  $2x - 3a = c$
16. Solve for x:  $\frac{5}{2x - 3} - \frac{8}{3 - 2x} = 1$

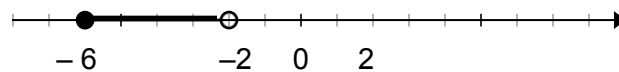
17. Solve for  $x$  and  $y$ :  $\begin{cases} 2x = y \\ 3x - 4y = 5 \end{cases}$
18. Solve for  $x$  and  $y$ :  $2x + y = 4$  and  $x - 3y = 9$
19. Solve for  $x$ :  $4 - 7x < 8$
20. Solve for  $x$ :  $4x - 7 = 13$

#### Topic IV – Quadratic Equations

21. Solve for  $x$ :  $(x + 5)\left(x - \frac{3}{2}\right) = 0$
22. Solve for  $x$ :  $4x^2 + 7x = 12x$
23. Solve for  $x$ :  $x(2x - 7) = -6$
24. Solve for  $x$ :  $x^2 - 4x + 2 = 0$
25. Solve for  $x$ :  $x^2 + 6x = 0$
26. OMIT Solve for  $x$ :  $x^4 - x^2 - 12 = 0$
27. Solve for  $x$ :  $x - 5 = -\frac{6}{x}$

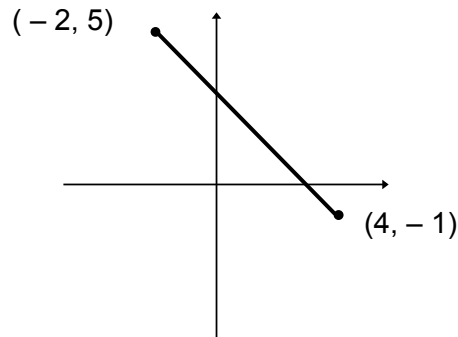
#### Topic V – Graphing

28. Graph the point  $(-2, 3)$
29. Express the graph shown in interval notation.



30. Graph  $3x - 2y \leq -2$  and  $y \geq 0$  on the same set of axes.

31. Find the midpoint of this line segment.

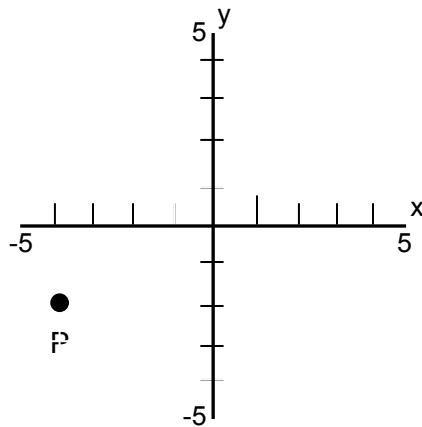


32. What if anything can be said about the following lines:

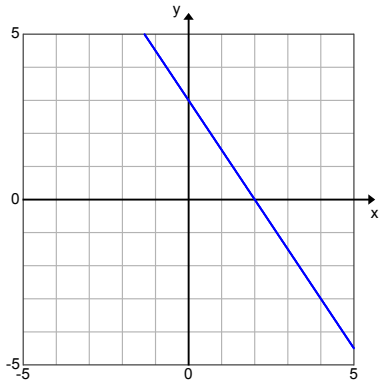
- I.  $y = 3x - 7$
- II.  $x + 3y = 6$
- III.  $y = \frac{-1}{3}x - 3$

- A. (I) is parallel to (II)
- B. (II) is parallel to (III)
- C. (I) is perpendicular to (III)
- D. (I) is perpendicular to (II)
- E. Both A and B are true
- F. Both B and D are true
- G. None of the above are true.

33. If  $(a, b)$  denotes the coordinates of the point P in the graph below, then where is the point with coordinates  $(a, -b)$ ?



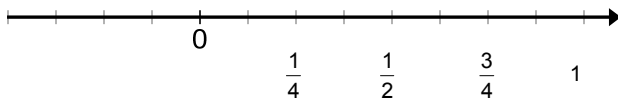
34. What is the equation of this line?



35. Graph  $y > 3x - 2$

36. Graph  $x + 2y \leq 2$

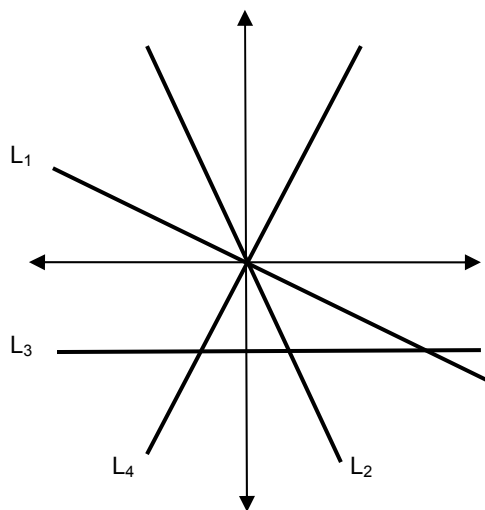
37. Where does  $\frac{5}{13}$  graph on this number line?



38. Graph the solution set for this inequality:  $-5 \leq 3x < 2$

39. Find the slope of the line passing through the points  $(-2, 3)$  and  $(-5, -1)$ .

40. Which line is the graph of  $y = -2x$ ?





## Topic VI – Rational Expressions

41. If  $x = 2$  and  $y = -3$ , then  $\frac{xy^2 - 2x}{3x^2 - xy} =$
42. Simplify:  $\frac{(2x+1)(x-2)}{6x+3}$
43. Simplify:  $\frac{x^2 + x - 6}{x - 2}$
44. Simplify:  $\frac{a^2b + ab^2 + a^3b^4}{a^2b}$
45. Find the quotient of the following:  $\frac{x^3 - 3x^2 - 4x + 12}{x - 2}$
46. Add and simplify:  $\frac{2}{x+1} + \frac{1}{x-1}$
47. Subtract and simplify:  $\frac{2x-1}{x+2} - \frac{2}{x-3}$
48. Divide and simplify:  $\frac{x-2y}{2x+2y} \div \frac{xy-2y^2}{x^2-y^2}$

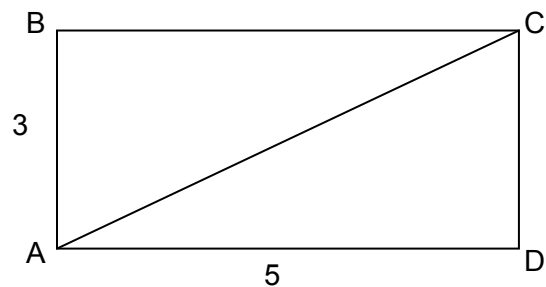
## Topic VII – Exponents and Square Roots

49. Evaluate:  $\frac{4^2}{4^6}$
50. Evaluate:  $\frac{(3^3)(2^5)(a^6)}{(a^5)(3^2)(2^2)}$
51. Simplify:  $\sqrt{48}$
52. Evaluate:  $2^{-3}$
53. Expand:  $(-x^2y^3)^3$

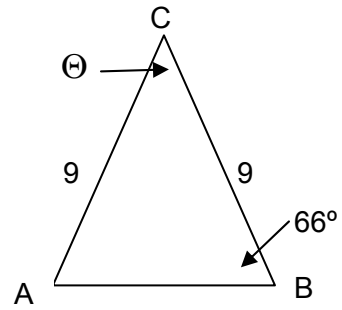
54. Multiply:  $(a^2b)(-b^5a^2)$
55. Expand and simplify:  $(\sqrt{3} - \sqrt{x})^2$
56. If  $x > 0$ , then  $\sqrt{14x} \cdot \sqrt{7x^3} =$
57. Simplify:  $\sqrt{36a^2 + 16b^2}$
58. Simplify:  $2\sqrt{8} + \sqrt{32} - \sqrt{50}$
59. Simplify and express with positive exponents:  $\frac{x^{-3}y^2x}{x^2y^{-2}y^{-1}}$
60. Simplify:  $\frac{(7a^2b)(3a^3b)^2}{a^3b^3}$
61. Simplify and express with positive exponents:  $\frac{x^{-3}y^2z^{-4}}{x^2y^{-2}z^{-5}}$
62. Simplify and express with positive exponents:  $(x^{-7}y^2)(x^4y^{-3})^{-1}$
63. Express the following in scientific notation:    a) 2,365,000  
  b) - .000456
64. Express the following in standard notation:    a)  $-2.51 \times 10^4$   
  b)  $6.156 \times 10^{-2}$

## Topic VIII – Geometric Measurement

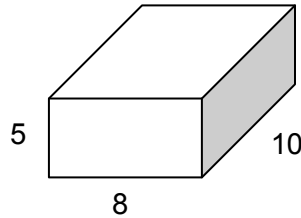
65. In the rectangle ABCD shown, find the length of AC.



66. Find the measure of  $\Theta$  in the triangle ABC.

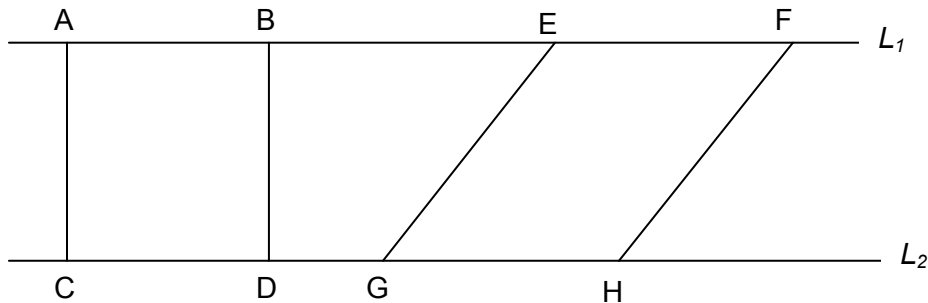


67. Find the surface area of the rectangular prism pictured here.  
Find the volume also.

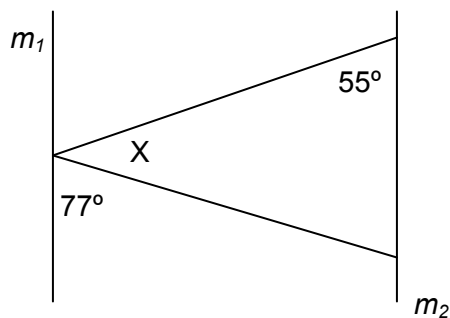


68. The area of a circle is  $\frac{25\pi}{4}$ . Find the radius of the circle.

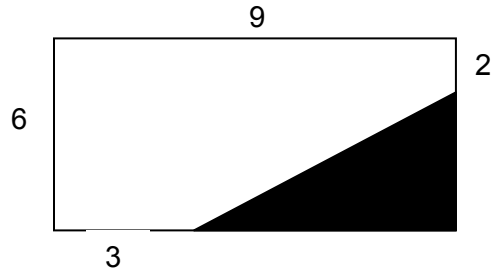
69. Lines  $L_1$  and  $L_2$  are parallel and  $AB = EF$ . What is true about the areas of ABDC and EFHG?



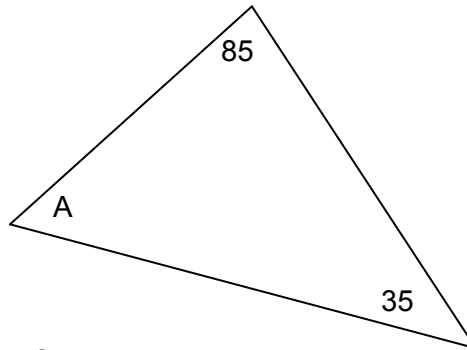
70. Find the measure of angle X. Lines  $m_1$  and  $m_2$  are parallel.



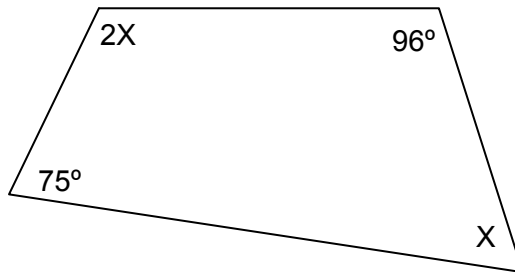
71. Find the area of the shaded region.



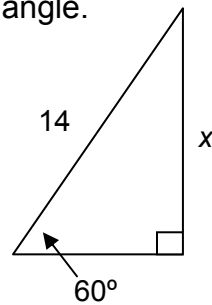
72. Find the measure of angle A.



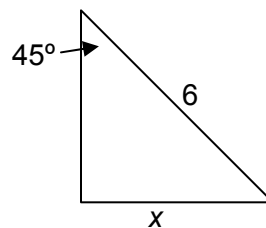
73. Find the measure of X in this figure.



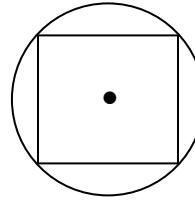
74. Find the measure of x in this right triangle.



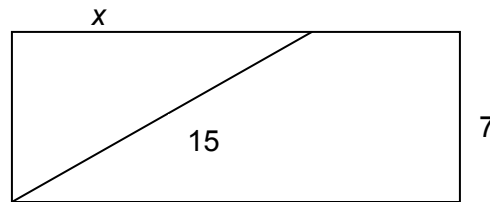
75. Find the length of x in this right triangle.



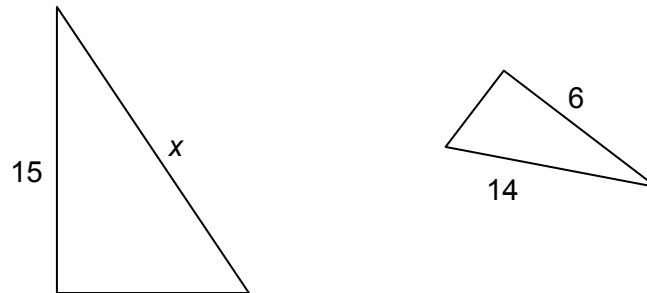
76. The radius of the circle is 5.  
What is the perimeter of the square?  
What is the area of the square?



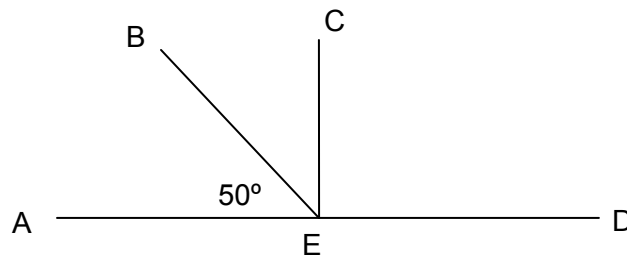
77. Find the length of  $x$  in the figure shown here.



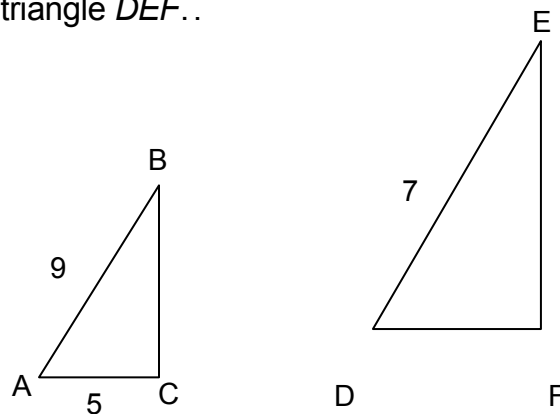
78. These triangles are similar. Find  $x$ .



79. Find the measure of  $\angle BEC$  if  $\angle CED$  is a right angle.



80. Triangle  $ABC$  is similar to triangle  $DEF$ ..  
Find the length of  $DF$ .



## Topic IX – Word Problems

82. The length of a rectangle is 3 times its width plus 3 inches. If the perimeter is 54 inches, how wide is the rectangle?
83. An item is sold for \$138. If this price is 15% more than the cost, what is the cost of the item?
84. A number is divided by 5 and then multiplied by 7. The result is 14. Find the number.
85. Two integers have a sum of 22 and a product of 105. What are the numbers?
86. Ruth has \$1.15 in change consisting of only nickels and dimes. If she has 15 coins altogether, how many nickels and how many dimes does she have?
87. A triangle has an area of 16. If its base is half of its height, what is the base of the triangle?
88. \$9000 is invested in two accounts. Account A pays 4% annual interest and account B pays 6% annual interest. In one year a total of \$383 is earned in interest. How much was invested in each account?
89. The sum of three consecutive integers is 24. Find the numbers.

## Answers to the EGAD Sample Diagnostic Test

1.  $\sqrt[3]{.46}$  and  $.467$

2.  $\frac{1}{8}$

3.  $5.167$

4.  $2^{16}$

5.  $10a^3b^5 - 55a^2b^2 + 15ab^2$

6.  $(3a + 5b)(3a - 5b)$

7.  $x = -6, x = \frac{5}{2}$

8.  $-74$

9.  $4x^2 - 20xy + 25y^2$

10.  $(3a + 2)(a - 3)$

11.  $m^2 + 2m + 2$

12.  $-2wv - 7w + 4v - 4$

13.  $3ab^2z^2(5a^2z^3 - 3b + 8abz)$

14.  $x = -7$

15.  $x = \frac{3a + c}{2}$

16.  $x = 8$

17.  $x = -1, y = -2$

18.  $x = 3, y = -2$

19.  $x > -\frac{4}{7}$

20.  $x = 5$

21.  $x = -5, x = \frac{3}{2}$

22.  $x = 0, x = \frac{5}{4}$

23.  $x = \frac{3}{2}, x = 2$

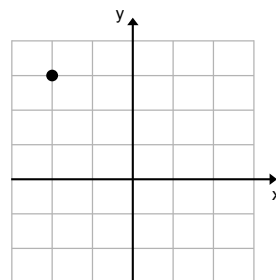
24.  $x = 2 \pm \sqrt{2}$

25.  $x = 0, x = -6$

26. OMIT  $x = \pm 2, \pm i\sqrt{3}$

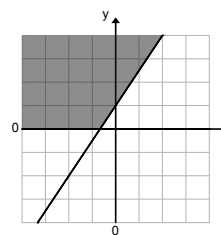
27.  $x = 2, x = 3$

28.



29.  $[-6, -2)$

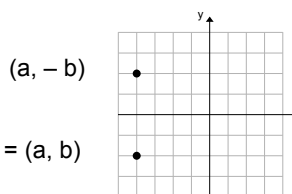
30.



31.  $(1, 2)$

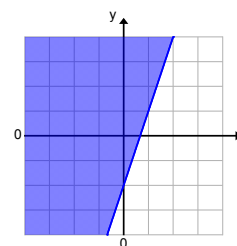
32. F

33.

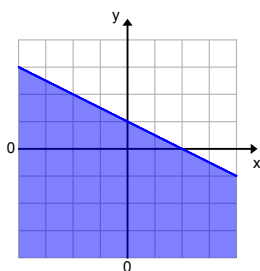


34.  $y = -\frac{3}{2}x + 3$  or  $3x + 2y = 6$

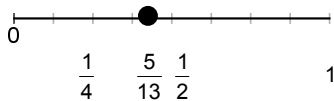
35.



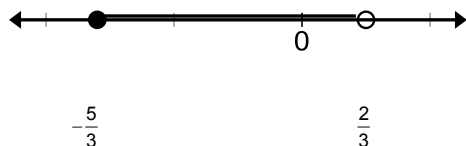
36.



37.



38.



39.  $\frac{4}{3}$

40.  $L_2$

41.  $\frac{7}{9}$

42.  $\frac{x-2}{3}$

43.  $x+3$

44.  $1 + \frac{b}{a} + ab^3$

45.  $x^2 - x - 6$

46.  $\frac{3x-1}{(x+1)(x-1)}$

47.  $\frac{2x^2 - 9x - 1}{(x+2)(x-3)}$

48.  $\frac{x-y}{2}$

49.  $\frac{1}{4^4}$

50.  $24a$

51.  $4\sqrt{3}$

52.  $\frac{1}{8}$

53.  $-x^6y^9$

54.  $-a^4b^6$

55.  $3 - 2\sqrt{3x} + x$

56.  $7x^2\sqrt{2}$

57.  $2\sqrt{9a^2 + 4b^2}$

58.  $3\sqrt{2}$

59.  $\frac{y^5}{x^4}$

60.  $63a^5$

61.  $\frac{y^4z}{x^5}$

62.  $\frac{y^5}{x^{11}}$

63. a)  $2.365 \times 10^6$   
b)  $-4.56 \times 10^{-4}$

64. a)  $-25,000$   
b)  $.06156$

65.  $\sqrt{34}$

66.  $48^\circ$

67. Surface area: 340 square units  
Volume: 400 cubic units

68.  $\frac{5}{2}$

69. They are equal.

70.  $48^\circ$

71. 12 square units

72.  $60^\circ$

73.  $63^\circ$



74.  $7\sqrt{3}$
75.  $3\sqrt{2}$
76. Perimeter:  $20\sqrt{2}$  units  
Area: 50 square units
77.  $4\sqrt{11}$
78. 35
79.  $40^\circ$
80.  $\frac{35}{9}$
81. (7, 8)
82. 6 inches
83. \$120
84. 10
85. 7 and 15
86. 7 nickels and 8 dimes
87. 4
88. \$7850 in account A  
\$1150 in account B
89. 7, 8, 9

## Intermediate Algebra Diagnostic Test (IAD)

The Intermediate Algebra Diagnostic Test (IAD) is required in order to stay in these Math classes: Math 17, 24, 26A, 29, 107A, and Statistics 1.

The IAD has 45 multiple choice questions. The test time is 60 minutes. NO CALCULATORS are allowed.

What score do you need?

<b>For this Math course:</b>	<b>If your score is...</b>	<b>Then...</b>
Math 17 or 107A	8 or less 9 to 14 15 to 23 <b>24 to 28</b> <b>29 or more</b>	Take LS 7AB or LS 10 Take Math 9 Take Math 9 or Math 11 <b>Advisory qualification for course</b> <b>Qualifies for course</b>
Math 24, 26A, 29 Stats 1	8 or less 9 to 14 15 to 26 <b>27 to 31</b> <b>32 or more</b>	Take LS 7AB or LS10 Take Math 9 Take Math 11 <b>Advisory qualification for course</b> <b>Qualifies for course</b>

The following is a list of topics covered on the IAD. That is followed by an IAD Sample Test with answers which has problems in the same order as the topics list. If you find a section difficult, use the IAD Study Topics list to help you find a similar section in an Intermediate Algebra textbook. Read and work problems in the text until you understand how to do these problems. You may also find it helpful to do the Elementary Algebra Diagnostic (with Geometry) Test (EGAD) Sample Test as well.

### Study Guide: Intermediate Algebra Diagnostic Test

#### Topic I – Elementary Operations

- Simplification of algebraic expressions
- Laws of Exponents with positive integral exponents
- Scientific notation
- Absolute Value

#### Topic II – Rational Expressions

- Simplification, addition, subtraction, multiplication, division or rational expressions
- Complex rational expressions

### Topic III – Exponents and Radicals

- Laws of exponents with rational and literal exponents
- Numerical and algebraic calculations with rational exponents and radicals
- Factorization and simplification of algebraic expressions with rational and literal exponents and radicals
- Rationalization techniques

### Topic IV – Linear Equations and Inequalities

- Solution on one and two linear equations
- Solution of equations reducible to a linear equation
- Solution of linear equalities

### Topic V – Quadratic Polynomials, Equations, and Inequalities

- Polynomial algebra
- Factorization
- Completing the square
- Solution of quadratic equations by factoring and the quadratic formula
- Solution of quadratic inequalities
- Complex numbers

### Topic VI – Graphing and Geometry

- Points in the coordinate plane
- Distance in the coordinate plane
- Slope and intercepts and quadratic equations
- Graphs of linear and quadratic equations

### Topic VII – Logarithms and Functions

- Numerical and literal function evaluation
- Definition and rules of logarithms
- Logarithmic and exponential equations

### Topic VIII – Word Problems

- Problems involving percents, average, ratio, and proportions
- Problems leading to linear and quadratic equations
- Problems from geometry

## Intermediate Algebra Diagnostic Sample Test Questions

### Topic I—Elementary Operations

1. Express in scientific notation:  $(5.7 \times 10^6)(2.3 \times 10^{-3})$

2. Express in scientific notation:  $\frac{3.81 \times 10^{-5}}{1.05 \times 10^{-7}}$

3. Simplify:  $\frac{4}{x} \cdot \frac{x^2 y^3}{24} \cdot \frac{9}{y^4}$

4. Add and simplify:  $2[(y - x) - 5] - 3[4 - (x - y)]$

5. If  $x = (-1)$  and  $a = 2$ , then  $\frac{(x^3)^{-1} \cdot a^4}{a^2 x^2} =$

6. If  $a = -3$ , evaluate:  $|1 - a| - 2|a + 2| + 1$

### Topic II –Rational Expressions

7. Add and simplify:  $\frac{xy^2 - x^2y}{xy + y^2} + 2x$

8. Add and simplify:  $\frac{xy^3}{y - x} + \frac{y^5 + xy^4}{xy + y}$

9. Simplify:  $\frac{y - x}{(2 + 2x^2)} \cdot \frac{4x^2}{(x^2 - y^2)}$

10. Simplify:  $\frac{1}{x + 2} - \frac{x + 3}{x^2 + 3x + 2} + \frac{3x - 1}{x^2 - 1}$

11. Simplify:  $\frac{\left(\frac{3}{y} + \frac{1}{4}\right)}{\left(y - \frac{1}{4y}\right)}$

12. Simplify: 
$$\frac{\left(\frac{-1}{x+1} + \frac{x}{2}\right)}{\left(\frac{1}{x+1} - \frac{3}{x}\right)}$$

### Topic III – Exponents and Radicals

Assume all variables are positive real numbers

13. Evaluate:  $8^{-2/3}$

14. Simplify:  $\sqrt{10} \cdot \sqrt{20}$

15. Simplify:  $\sqrt{16x^2 + 24y^2 + 36z^2}$

16. Simplify: 
$$\frac{(3ab^{1/2})(4a^2b)^{-2}}{ab^{3/2}}$$

17. Simplify:  $(x^{-3}y^2)^2(x^{-6}y^2)^{-2}$

18. Simplify:  $\sqrt{8a^3} + a\sqrt{32a} + \sqrt[3]{16a^3}$

19. Simplify: 
$$\left(\frac{4^3 x^{3/2} y^{4/3}}{16x^{-1/2} y^2}\right)^{-1/2}$$

20. Simplify:  $\frac{a^{3x+2}}{a^{4-x}}$

21. Simplify:  $\frac{z^2 x^{-4} y^3}{y^{-2} z x^{-2}}$

22. Express without radical signs:  $\sqrt[3]{x^2} \cdot \sqrt[5]{x}$

23. Express without radical signs:  $\sqrt{\sqrt[3]{z^7}}$

24. Solve for y:  $2x = \frac{5-3y}{4}$

25. Simplify:  $\frac{10^x}{2^x}$

26. Rationalize the denominator:  $\frac{2}{\sqrt{3}-\sqrt{7}}$

#### Topic IV – Linear Equations and Inequalities

27. Solve this system of equations: 
$$\begin{cases} \frac{1}{2}x + 3y = -5 \\ 5x - 2y = 14 \end{cases}$$

28. Solve this system of equations: 
$$\begin{cases} 4x = 5y \\ 2x + 3y = 22 \end{cases}$$

29. Solve for  $x$ :  $2 - \sqrt{1-x} = -3$

30. Solve for  $m$ :  $17 - 9m > -4(m + 5)$

31. Solve for  $x$ :  $3(5 - 4x) - (3 - 7x) = -(2 + 9x)$

#### Topic V – Quadratic Polynomials, Equations, and Inequalities

32. Multiply:  $(x^2 - 5x)(4x^2 - 3x + 2)$

33. Factor:  $4a^2 - 9a^2b^4$

34. Solve for  $x$ :  $x^2 + \frac{5}{2}x = \frac{3}{2}$

35. Solve for  $x$ :  $x^4 + x^2 - 2 = 0$

36. If you solve this equation by completing the square, what do you add to each side of the equation?  $x^2 + 3x = 4$

37. Solve for  $x$ :  $2x^2 + 4x + 1 = 0$

OMIT 38. Solve for  $t$ :  $t - 6t^{1/2} + 5 = 0$

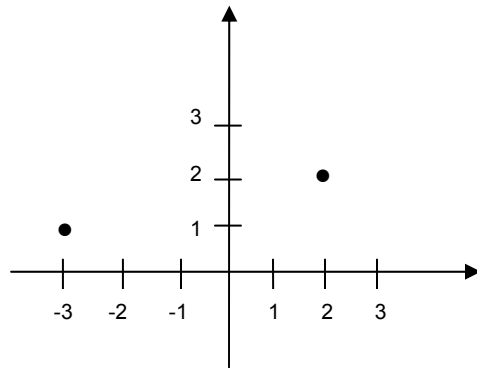
OMIT 39. Solve for  $a$ :  $\sqrt{2a-5} - \sqrt{a-2} = 2$

40. Simplify:  $\frac{i}{2-5i}$

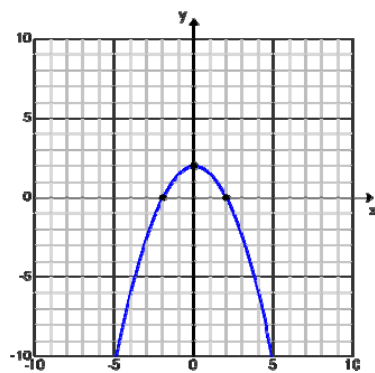
41. Solve for  $z$ :  $3z^2 - 4z + 2 = 0$
42. Solve for  $a$ :  $3 - \frac{1}{1+2a} = \frac{1}{a-1}$
43. For what values of  $m$  is  $(2m-1)(m-5) > 0$ ?

### Topic VI – Graphing and Geometry

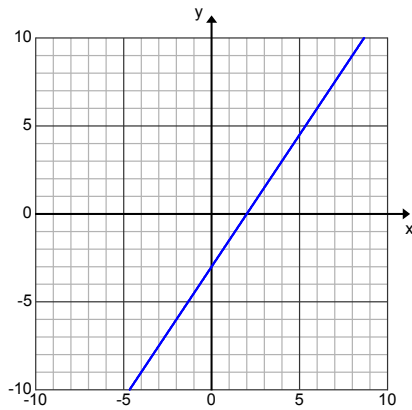
44. Find the equation of the line which passes through the points  $(1, 3)$  and  $(7, -2)$ .
45. Find the equation of the line with a slope of 3 which passes through the point  $(0, -2)$
46. Find the distance between points A and B in the graph shown below.



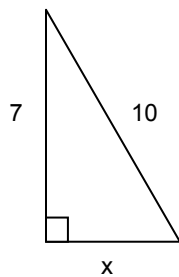
47. What is the midpoint between the points  $(-5, 3)$  and  $(7, -2)$
48. Find the quadratic function whose graph is shown in the figure below.



49. Find the slope of the line,  $L$ , shown in the figure below.



50. Graph the equation:  $y = 4$
51. Graph the equation:  $3x - 4y - 5 = 0$
52. Graph the equation:  $y = 2x^2 - 1$
53. OMIT
54. Find the value of  $x$ :



55. OMIT
56. OMIT
57. OMIT
58. OMIT
59. OMIT
60. OMIT



## Topic VII – Logarithms and Functions

61. If  $f(x) = 3x^2 - 4x + 5$ , then  $f(u - 2) =$
62. If  $f(h) = h + \frac{3}{h} + 2$ , find  $f(-3)$ .
63. Write  $\log_b a = x$  in exponential form.
64. Solve for  $x$ :  $4^{3x} = 16$
65. Solve for  $x$ :  $\log_x 125 = 3$
66. Evaluate:  $\log_{64} 16$
67. Solve for  $x$ :  $\log_5 (2x + 5) = 3$
68. Solve for  $x$ :  $\log_2 x + \log_2 (x - 7) = 3$
69. Simplify:  $\log_5 25 - \log_4 \frac{1}{16} - \log_7 7 =$

## Topic VIII – Word Problems

70. You can exchange \$2.00 for £1.7. How many pounds (£) can you get for \$15?
71. The side of a square is doubled. How much does the area change?
72. If 73% of a number is 365, what is the number?
73. 10 is to 28 as 35 is to what number?
74. The product of two numbers is  $-48$ . Their sum is 13. What are the numbers?
75. A rectangle has an area of 40 and a perimeter of 26. What are the dimensions of the rectangle?
76. Five times a positive number is equal to the difference of the square of that number and 36. What is the number?

## Answers to the Intermediate Algebra Sample Test

1.  $1.3 \times 10^4$
2.  $3.63 \times 10^2$
3.  $\frac{3x}{2y}$
4.  $x - y - 22$
5.  $-4$
6.  $3$
7.  $\frac{x^2 + 3xy}{x + y}$
8.  $\frac{xy^3 + y^5}{(y - x)(x + 1)}$
9.  $\frac{-2x^2}{(1 + x^2)(x + y)}$
10.  $\frac{3x}{x^2 + x - 2}$
11.  $\frac{12 + y}{4y^2 - 1}$
12.  $\frac{-x(x + 2)(x - 1)}{2(2x + 3)}$
13.  $\frac{1}{4}$
14.  $10\sqrt{2}$
15.  $2\sqrt{4x^2 + 6y^2 + 9z^2}$
16.  $\frac{3}{16a^4b^3}$
17.  $x^6$
18.  $6a\sqrt{2a} + 2a^3\sqrt{2}$
19.  $\frac{y^{1/3}}{2x}$
20.  $a^{4x-2}$
21.  $\frac{zy^5}{x^2}$
22.  $x^{2/3} \cdot x^{1/5} = x^{13/15}$
23.  $\left(z^{7/3}\right)^{1/2} = z^{7/6}$
24.  $y = \frac{5 - 8x}{3}$
25.  $\left(\frac{10}{2}\right)^x = 5^x$
26.  $\frac{-3 - \sqrt{7}}{2}$
27.  $x = 2, y = -2$
28.  $x = 5, y = 4$
29.  $x = -24$
30.  $m < \frac{-37}{5}$
31.  $x = -\frac{7}{2}$
32.  $4x^4 - 23x^3 + 17x^2 - 10x$
33.  $a^2(2 + 3b^2)(2 - 3b^2)$
34.  $x = \frac{1}{2}$  or  $x = -3$
35.  $(x^2 + 2)(x + 1)(x - 1) = 0$   
 $x = \pm i\sqrt{2}, \pm 1$
36. Add  $\frac{9}{4}$
37.  $x = \frac{-2 \pm \sqrt{2}}{2}$
38.  $1, 25$
39.  $a = 27$  (only 27 checks)
40.  $\frac{-5 + 2i}{29}$
41.  $z = \frac{2 \pm i\sqrt{2}}{3}$
42.  $a = \frac{1 \pm \sqrt{3}}{2}$

43.  $m < \frac{1}{2}, m > 5$

44.  $y = -\frac{5}{6}x + \frac{23}{6}$  or  $5x + 6y = 23$

45.  $y = 3x - 2$

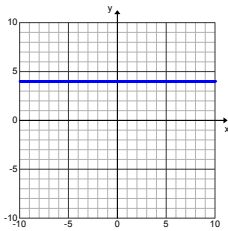
46.  $\sqrt{26}$

47.  $\left(1, \frac{1}{2}\right)$

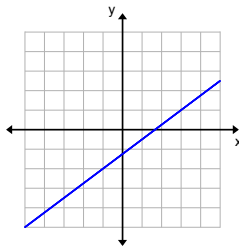
48.  $y = -\frac{1}{2}x^2 + 2$

49.  $m = \frac{3}{2}$

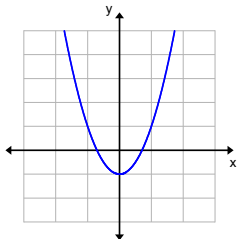
50.



51.  $\left(0, -\frac{5}{4}\right)$  and  $\left(\frac{5}{3}, 0\right)$



52.



53. OMIT

54.  $\sqrt{51}$

55. – 60. OMITTED

61.  $3u^2 - 16u + 25$

62.  $-2$

63.  $a = b^x$

64.  $x = \frac{2}{3}$

65.  $x = 5$

66.  $\frac{2}{3}$

67.  $x = 60$

68.  $x = 8$  ( $x$  cannot be  $-1$ )

69.  $3$

70. £12.75

71. 4 times

72. 500

73. 98

74.  $-3$  and  $16$

75.  $5 \times 8$

76.  $9$

## Calculus Readiness Diagnostic Test (CR)

The Calculus Readiness Diagnostic Test (CR) is required in order to remain enrolled in Math 30. There are 60 multiple choice questions on this exam and the test has a 90 minute time limit. No calculators are allowed.

What score do you need:

If your score is...	Then...
17 or less	Take Math 9
18 to 26	Take Math 11
27 to 31	Advisory qualification for Math 29
32 to 35	Qualifies for Math 29
<b>36 to 40</b>	<b>Advisory qualification for Math 30</b>
<b>41 or more</b>	<b>Qualifies for Math 30</b>

The following Precalculus Study Topics list covers the topics on the Calculus Readiness Test. This section is then followed by sample test questions arranged in the same topical order. If you find a section difficult, use the Precalculus Study Topics List to help you find a similar section in a Precalculus textbook. Then read and work problems in the text until you understand how to do these problems. You may also find it helpful to work through the EGAD and IAD Sample Tests.

### Calculus Readiness Test Study Topics

#### Topic I – Rational Expressions

Addition, Subtraction, Multiplication, Division of rational expressions  
Complex rational expressions

#### Topic II – Exponents and Radicals

Laws of Exponents  
Calculations with exponents and radicals  
Conversion between radicals and exponents  
Rationalization techniques

#### Topic III – Linear Equations, Inequalities, Absolute Value

Solution of one and two linear equations  
Solution of equations reducible to linear equations  
Graphs of linear inequalities  
Solution of linear inequalities

Simplification of expressions involving absolute value  
Solution of equations and inequalities involving absolute value

#### Topic IV – Polynomials and Polynomial Equations

Polynomial algebra  
Factorization  
Completing the square  
Solution of polynomial equations by factoring  
Solution of quadratic equations by quadratic formula  
Graphs of quadratic equations  
Solution of quadratic inequalities

#### Topic V – Functions

Function concept and notation  
Function evaluation and composition  
Graphs of translations, reflections, and absolute value functions

#### Topic VI – Trigonometry

Right angle trigonometry  
Trigonometric functions and circular functions  
Radian and degree measure  
Special angles  
Trigonometric identities  
Graphs of trigonometric functions

#### Topic VII – Logarithmic and Exponential Functions

Definition and laws of logarithms  
Evaluation of logarithmic expressions  
Graphs of logarithmic and exponential functions  
Inverse relation between logarithm and exponential functions  
Logarithmic and exponential equations

#### Topic VIII – Word Problems

Problems involving percent, average, ratio, and proportion  
Problems leading to linear and quadratic equations  
Problems from geometry

## Calculus Readiness Sample Test Questions

### Topic I – Rational Expressions

Simplify the following:

1.  $\left(\frac{9x^2 - 12x}{x^2 + 1}\right)\left(\frac{2x^2 + 2}{9x^2 + 6x - 24}\right)$

2.  $\frac{\left(1 - \frac{3}{x}\right)}{9 - x^2}$

3.  $\left(\frac{6v^3}{u^2}\right)\left(\frac{-uv}{2v}\right)\left(\frac{1}{7v^2}\right)$

4.  $\frac{-4}{9 - x^2} - \frac{2x + 1}{x^2 - 3x}$

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

6.  $\left(\frac{2a}{b} - \frac{b}{a}\right)^{-2}$

7.  $\frac{\left(\frac{xy^2}{x + y}\right)}{\left(\frac{x - y}{x^2 - y^2}\right)}$

8.  $\frac{\left(\frac{m}{m - 3} - \frac{2m}{m^2 - 2m - 3}\right)}{\left(\frac{2}{m + 1} - \frac{1}{m}\right)}$

### Topic II – Exponents and Radicals

9. Evaluate:  $81^{-3/4}$

Simplify the following:

10.  $\sqrt{6}\sqrt{15}$

11.  $\sqrt{(a+b)(a^2-b^2)}$

12.  $\sqrt{16x^2 + 24y^2 + 36z^2}$

13.  $\frac{(3xy^{1/2})(4x^2y)^{-2}}{xy^{3/2}}$

14.  $\frac{a^{-2}b^3c}{a^{-1}b^{-2}c^0}$

15.  $\frac{a^{3x+2}}{a^{4-x}}$

16.  $(m^{b+1})^{b-1}$

17.  $\left(\frac{4^3x^{3/2}y^{4/3}}{16x^{-1/2}y^2}\right)^{-1/2}$

18.  $(-125x^{18}y^{24})^{-2/3}$

19.  $(\sqrt[4]{m^6})(2m\sqrt{m})$

20.  $2\sqrt{12} + \sqrt{27} - \sqrt{48}$

Rationalize the following:

21.  $\frac{x}{\sqrt[5]{4}}$

22.  $\frac{\sqrt[3]{x}}{\sqrt[15]{x^2}}$

23. Solve for x:  $3^{5x+2} = 27^{x-4}$

Topic III – Linear Equations, Inequalities, and Absolute Value

24. Solve for x:  $3x = \frac{a}{b}(x-1)$

25. Solve for  $a$ :  $\sqrt{a-2} + 3 = 7$

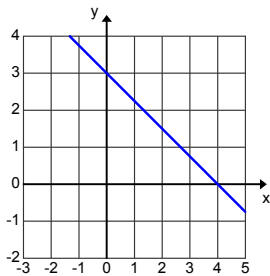
26. Solve for  $x$ :  $\frac{3}{x} - \frac{2}{x+1} = \frac{5x+3}{x+1}$

27. Solve this system of equations:  $\begin{cases} 2x + 3y = -5 \\ 5x - 2y = 8 \end{cases}$

28. Solve this system of equations:  $\begin{cases} 3x = 4y \\ 2x + 3y = 17 \end{cases}$

29. If  $m = -3$ , evaluate  $|3-m| + |-4| - |-m|$

30. Find the equation of this line:



31. Solve for  $x$ :  $|5-2x| \leq 3$

32. Given the points (1, 1) and (3, 4), find the area of the right triangle formed by the line through those points, the x-axis, and  $x = 3$ .

#### Topic IV – Polynomials and Polynomial Equations

33. Solve for  $x$ :  $x - 6x^{1/2} + 5 = 0$

34. Solve for  $x$ :  $-4x^2 + 12x + 3 = 0$

35. Solve for  $x$ :  $(x-2)(x-3) = 2$

36. If you wanted to complete the square, what would you add to both sides?  
 $x^2 - 3x = 2$

37. Solve for  $x$ :  $2 = \sqrt{2x-5} - \sqrt{x-2}$

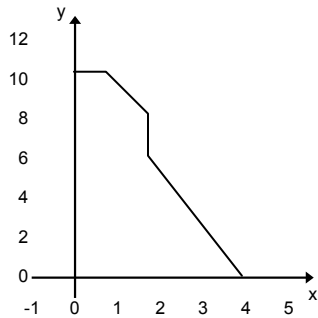


38. Simplify:  $\frac{x^4 - 14x^2 + 3x + 34}{x - 2}$
39. Find the values of  $a$  so that the following has 2 distinct real roots:  $2ax^2 - 12x - 7$
40. Solve for  $x$ :  $x^2 - x - 42 > 0$
41. Graph:  $y = x^2 - x - 6$
42. Graph:  $|x + 2| = y$
43. Graph:  $y = 2^x + 1$
44. Graph:  $y = \frac{2}{x}$
45. If  $x = 3$ ,  $y = -1$ , and  $z = -2$ , evaluate  $\frac{x^2 - xy^2z}{z^2y^2 - xz}$
46. Find the vertical and horizontal asymptotes of  $f(x) = \frac{x + 1}{(2x - 1)(x + 3)}$

### Topic V – Functions

47. Find  $f(0)$  when  $f(x) = \frac{3x^3 - 4x + 5}{ax^2 + bx - 2}$
48. If  $f(x) = -\frac{2}{x-1}$ , find  $f\left(\frac{1}{x+3}\right)$ .
49. If  $f(x) = x^2 - 1$  and  $g(x) = 2x + 1$ , find: a)  $f(g(x))$  and b)  $g \circ f(x)$
50. If  $f(x) = \frac{3x + 2}{2x - 1}$ , for what  $x$  does  $f(x) = -3$ ?
51. Find  $\frac{4}{f(3)}$  if  $f(t) = \frac{t^2 - 1}{2t - 2}$
52. Graph:  $f(x) = \frac{1}{2x + 1}$
53. Graph:  $f(x) = |x^2 - 2|$

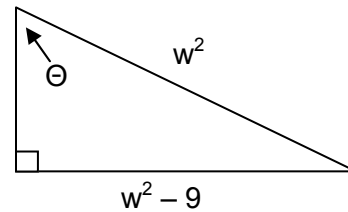
54. Find the domain and range of  $g(x) = \sqrt{x^2 - 2x - 5}$
55. Express the domain and range of  $g(x) = (25 + 4x - x^2)^{\frac{1}{2}}$  in interval notation (with exact answers, no decimals).
56. Find the area of the interior region of this figure:



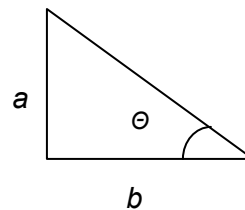
57. Let  $f(x) = 3x - 5$ . If  $3f(a) = f(2a + 1)$ , then  $a =$

### Topic VI – Trigonometry

58. Find  $\cos(\theta)$  in the given triangle.



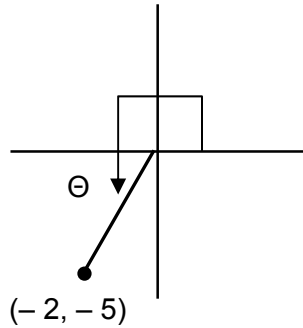
59. Use this triangle to find  $\cot\theta \sin\theta$ .



60. Evaluate:  $\cos(\theta + \pi)$
61. Verify this identity:  $\sec\theta - \cos\theta = \tan\theta \sin\theta$
62. Graph the function:  $y = \frac{3}{2} \cos 2x$

63. Graph:  $y = \sin \frac{x}{2}$

64. In the figure shown, find  $\csc \theta$ .



65. Express  $114^\circ$  in radians.

66. Which trig functions are even?

67. Find  $\sin^{-1}\left(\frac{\sqrt{12}}{4}\right)$ .

68. Find  $\cos\left(\frac{5\pi}{3}\right)$ .

### Topic VII – Logarithmic and Exponential Functions

69. Solve for  $b$ :  $\log_a b = x$

70. Solve for  $x$ :  $2^x = 5$

71. Evaluate:  $\log_{36} \sqrt[3]{6}$

72. Evaluate:  $\log_9 \left(\frac{9^6}{27}\right)$

73. Simplify:  $\log a^2 b - \log 2a + \log b$

74. Solve for  $x$ :  $5^{3x} - \frac{1}{25} = 0$

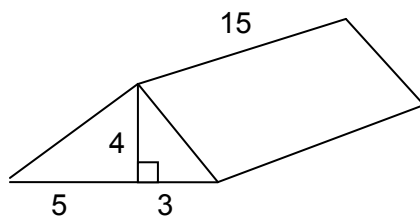
75. Solve for  $y$ :  $\log_4(3y - 5) = 2$

76. Graph:  $y = \left(\frac{1}{3}\right)^{-x}$

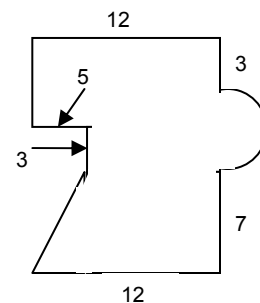
77. Graph:  $x = \log_2(y + 3)$

### Topic VIII – Word Problems

78. A bakery has a special on peanut butter cookies and chocolate chip cookies. There are 12 dozen cookies on special. If there are 40% more chocolate chip cookies than peanut butter cookies, how many chocolate chip cookies are there?
79. A 24w by 36L inch poster is enlarged so that its length is 5 ft. What is its width?
80. The circumference of a circle is quadrupled. How much is the area increased?
81. The sum of two numbers is  $179\frac{1}{2}$ . Six times the first number minus seven times the second number is 778. Find the numbers.
82. The cube root of a number is squared and the result is 16. What is the number?
83. The price of an airplane ticket is decreased 16% to \$193.20. What was the original price?
84. If the radius of a circle is decreased by 15%, what is the percent decrease in the area of the circle?
85. What is the surface area of the given triangular prism?



86. Find the area of the given figure to the nearest tenth.



87. How long does it take something to travel 500 meters at 42 meters per second?
88. A tree twenty-five feet tall casts a shadow that is 35 feet long. If the shadow of a nearby building is 119 feet long, how tall is the building?

## Answers to the Calculus Readiness Sample Test Questions

1.  $\frac{2x}{x+2}$

2.  $\frac{-1}{x(x+3)}$

3.  $\frac{-3v}{7u}$

4.  $\frac{2x^2 + 3x + 3}{x(x+3)(3-x)}$

5.  $\frac{9b}{(x+2b)(3b-x)(x-b)}$

6.  $\frac{a^2b^2}{(2a^2 - b^2)^2}$  or  $\frac{a^2b^2}{4a^4 - 4a^2b^2 + b^4}$

7.  $xy^2$

8.  $\frac{m^2}{m-3}$

9.  $\frac{1}{27}$

10.  $\sqrt{90} = 3\sqrt{10}$

11.  $(a+b)\sqrt{a-b}$

12.  $2\sqrt{4x^2 + 6y^2 + 9z^2}$

13.  $\frac{3}{16x^4y^3}$

14.  $\frac{b^5c}{a}$

15.  $a^{4x-2}$

16.  $m^{b^2-1}$

17.  $\frac{y^{1/3}}{2x}$

18.  $\frac{1}{25x^{12}y^{16}}$

19.  $2m^3$

20.  $3\sqrt{3}$

21.  $\frac{x\sqrt[5]{8}}{2}$

22.  $x^{1/5}$

23.  $x = -7$

24.  $\frac{-a}{3b-a}$  or  $\frac{a}{a-3b}$

25.  $a = 18$

26.  $x = \frac{3}{5}$

27.  $x = \frac{14}{19}, y = \frac{-41}{19}$

28.  $x = 4, y = 3$

29. 7

30.  $3x + 4y = 12$

31.  $1 \leq x \leq 4$

32. The line formed by the 2 points is  $3x - 2y = 1$ . This line intersects the

x-axis at  $\left(\frac{1}{3}, 0\right)$ , so the base of the

right triangle is  $3 - \frac{1}{3} = \frac{8}{3}$  units in length.

The area is then  $\frac{16}{3}$  sq units.

33.  $x = 1, 25$

34.  $\frac{3 \pm 2\sqrt{3}}{2}$

35.  $x = 1$  or 4

36. Add  $\frac{9}{4}$  to both sides.

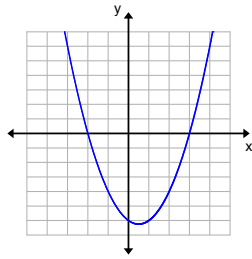
37.  $x = 27$  (3 doesn't work)

38.  $x^3 + 2x^2 - 10x - 17$

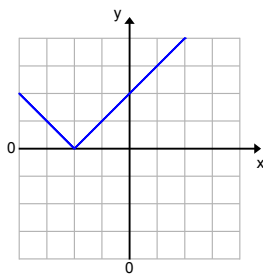
39.  $a > \frac{-18}{7}$

40.  $x < -6$  or  $x > 7$

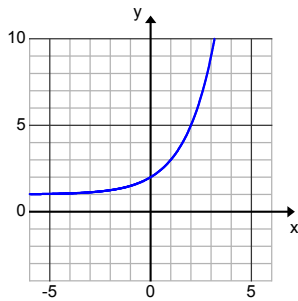
41.



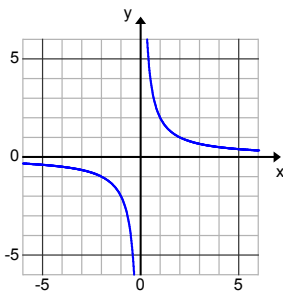
42.



43.



44.



45.  $\frac{3}{2}$

46. Vertical:  $x = \frac{1}{2}, x = -3$

Horizontal:  $y = 0$

47.  $-\frac{5}{2}$

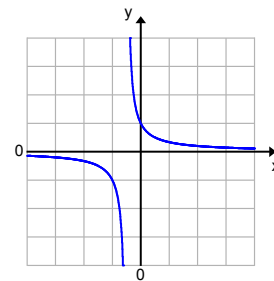
48.  $\frac{2(x+3)}{x+2}$

49. a)  $4x^2 - 4x$       b)  $2x^2 - 1$

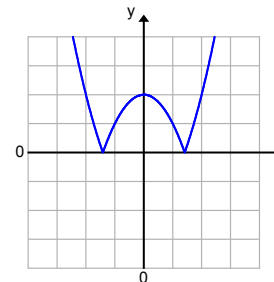
50.  $x = \frac{1}{9}$

51. 2

52.



53.



54. domain:  $x \leq (1 - \sqrt{6})$  or  $x \geq (1 + \sqrt{6})$

range:  $0 \leq g(x) \leq \infty$

55. domain:  $[2 - \sqrt{29}, 2 + \sqrt{29}]$

range:  $[2, \sqrt{29}]$

56.  $(1 \cdot 2) + \frac{1}{2}(1 \cdot 2) + (2 \cdot 8) + \frac{1}{2}(2 \cdot 6) = 25$

57.  $a = \frac{13}{3}$

58.  $\cos \theta = \frac{3\sqrt{2w^2 - 9}}{w^2}$

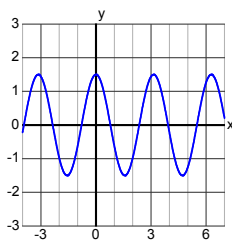
59.  $\frac{b}{\sqrt{a^2 + b^2}}$

60.  $-\cos \theta$

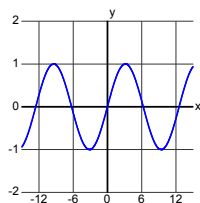
61.

$$\begin{aligned} \sec \theta - \cos \theta &= \frac{1}{\cos \theta} - \cos \theta \\ &= \frac{1 - \cos^2 \theta}{\cos \theta} \\ &= \frac{\sin^2 \theta}{\cos \theta} \\ &= \frac{\sin \theta}{\cos \theta} \cdot \sin \theta \\ &= \tan \theta \sin \theta \end{aligned}$$

62.



63.



64.  $\frac{-\sqrt{29}}{5}$

65.  $\frac{19\pi}{30}$

66. cosine and secant

67.  $\frac{\pi}{3}$  or  $60^\circ$

68.  $\frac{1}{2}$

69.  $b = a^x$

70.  $x = \frac{\log 5}{\log 2}$  or  $\frac{\ln 5}{\ln 2}$

71.  $\frac{1}{6}$

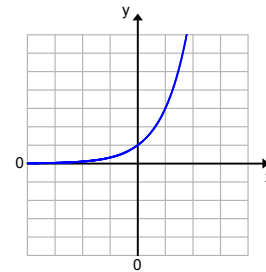
72.  $\frac{9}{2}$

73.  $\log\left(\frac{ab^2}{2}\right)$

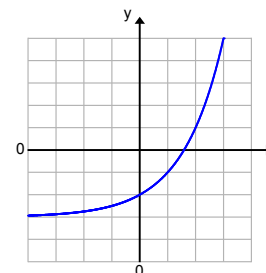
74.  $x = -\frac{2}{3}$

75.  $y = 7$

76.



77.



78.  $p + 1.40p = 12$ ; 7 dozen chocolate  
chip cookies
79. 40 inches
80. 16 times
81.  $156\frac{1}{2}$  and 23
82.  $\pm 64$
83. \$230
84. 27.75%
85.  $227 + 15\sqrt{41}$
86. 173.6
87. 11.9 sec
88. 85 ft.