MATHEMATICS PRELIMINARY EXAMINATIONS

Descriptions and Sample Tests

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Some Careers Requiring Mathematics

Here are some careers that require more than one year of high school mathematics. Universities differ in specific requirements, of course.

A program in	requires this many years of high school math
_Agriculture:	
_Agricultural economics	3
_Entomology	3
_Environmental sciences	4
_Food sciences	3
_Forestry	3
_Genetics	3
_Landscape architecture	3
_Plant pathology	3
_Rural sociology	3
_Wildlife ecology	3
_Other areas of agriculture	2
_Architecture	3
_Art	2
_Business:	
_Accounting	3
_Economics	4
_Management	4
_Communications	2
_Education:	
_Elementary	3
_Child Development and Preschool	3
_Engineering	4
_History	2
_Language and Literature	2
_Law	3

A program in	requires this many years of high school math
_Life sciences:	
_Bacteriology	4
_Biochemistry	4
_Biology	4
_Linguistics	3
_Mathematical sciences	
_Mathematics	4
_Statistics	4
_Actuarial sciences	4
_Computer science	4
_Medicine:	
_Allied medicine	3
_Dental hygiene	3
_Dentistry	4
_Medical technology	4
_Nursing	3
_Optometry	4
_Physical therapy	3
_Pre-medicine	4
_Public health	3
_Music	2
_Pharmacy	4
_Philosophy	2
_Physical sciences:	
_Astronomy	4
_Chemistry	4
_Geology	4
_Physics	4
_Social sciences:	
_Anthropology	2
_Asian studies	2
_Black studies	3
_Geography	3
_Political science	3
_Psychology	4
_Social welfare	2
_Sociology	3
_Theater	2

WHAT?

On the preceding pages we have listed the years of high school mathematics preparation needed for each career. The California Community Colleges, the California State University, and the University of California have prepared a set of minimal competencies in mathematics which should be covered in a four-year college-preparatory high school mathematics program. This information is given below to help you evaluate your mathematics preparation.

2 YEARS of high school mathematics means:

Algebra I and Geometry

- Algebra I (one year)
  - Arithmetic operations and absolute values of positive and negative rational numbers
  - Arithmetic operations with literal symbols
  - Linear equations and their graphs
  - Inequalities
  - Ratio, proportion, and variation
  - Operations with integer exponents
  - Operations with polynomials and rational expressions
  - Systems of linear equations with two unknowns; solutions and applications
  - Special products and factoring
  - Solution of quadratic equations by factoring and formula
  - Solution of elementary word problems
  - Application of formulas for perimeters, areas, and volumes of simple geometric figures

- Geometry (one year)
  - Extensive reinforcement of the algebraic skills developed in Algebra I
  - Basic postulates of Euclidean geometry; proofs of geometric theorems
  - Angles, parallel lines, congruent and similar triangles, rectilinear figures, circles and arcs, Pythagorean theorem
  - Application of formulas for perimeters, areas, volumes, and surface areas of geometric figures
  - Geometric constructions; loci
  - Coordinate geometry; proofs of geometric theorems by coordinate geometric methods
  - Right triangle trigonometry
  - Solution of elementary word problems
  - Intuitive spatial geometry

3 YEARS of high school mathematics means:

Algebra I and Geometry (see page 3)

PLUS

Algebra II

- Algebra II (one year)
  - Simplification of algebraic expressions
  - Fractional exponents and radicals
  - Absolute value and inequalities
  - Operations on polynomials
  - Quadratic equations; completion of the square, quadratic formula, properties of roots
  - Complex numbers
  - Quadratic inequalities
  - Graphing linear and quadratic functions and inequalities; determination and interpretation of slopes
  - Solutions of equations with rational expressions
  - Systems of linear equations with two and three unknowns: homogeneous, dependent, and inconsistent systems
  - Polynomial equations
  - Binomial theorem
  - Arithmetic and geometric sequences and series
  - Exponential and logarithmic functions and equations
  - The function concept, including compositions and inverse functions; arithmetic operations on functions
  - Solution of word problems, including estimation and approximation

4 YEARS of high school mathematics means:

Algebra I, Geometry, and Algebra II (see page 3 and 4)

PLUS

Trigonometry, and Analytic Geometry, and Mathematical Analysis

- Trigonometry (one semester)
  - Trigonometric functions as ratios of lengths of sides of triangles and as circular functions
  - Graphical characteristics of trigonometric functions
  - Solution of right angles
  - Radian and degree measure
  - Trigonometric identities, including double angle, half angle, and additional formulas
  - Laws of sines and cosines; solution of oblique triangles
  - Reinforcement of function concept: exponential, logarithmic, and trigonometric functions
  - Inverse trigonometric functions and their graphs
  - Solution of trigonometric equations
  - Polar coordinates and vectors
  - Trigonometric form of complex numbers and de Moivre's theorem

- Analytic geometry and mathematical analysis (one semester)
  - Coordinate geometry, including detailed treatment of conic sections
  - Rational functions and their graphs
  - Elementary functions and their inverses, including graphs of these functions
  - Review of polar coordinates and vectors
  - Graphing in polar coordinates
  - Introduction to linear algebra
  - Mathematical induction
  - Parametric equations and their graphs
  - Lines and planes in space; three-dimensional coordinate geometry
  - Introduction to vectors in space

Before you are allowed to enroll in a mathematics course at this school, you may be required to take a diagnostic examination in mathematics. The purpose of this examination will be to determine which mathematics course you are prepared to enter, based upon your current knowledge of mathematics. The chart below relates the high school mathematics prerequisite and the particular diagnostic examination to the appropriate college mathematics examination.

High School Mathematics Prerequisite	Diagnostic Examination	College Mathematics Class
Algebra I and Geometry	Basic Algebra	Intermediate Algebra or College Algebra
Algebra II	Intermediate Algebra	Precalculus and Trigonometry
Mathematics Analysis/ Precalculus-Trigonometry	Precalculus	Calculus

This brochure has been developed to help you prepare for these tests. It contains descriptions of the tests, sample tests with answers and recommended text books to help you refresh your knowledge of the mathematics covered by the tests.

First you should read the description of the tests and decide which ones you think that you can pass. Then, review any material that you may have forgotten and take a sample test. Finally, check your answers with the answers in the back of this brochure. If you have done well on the test, you have a good chance of passing the corresponding diagnostic test this fall, although you should review the material a week or two before you take the diagnostic test. You should follow this procedure with each of the three sample tests in this brochure until you come to a test which gives you difficulty. If this occurs you should review the recommended study materials before retaking the sample test.

WARNING:

The sample test questions cover the same general material that is tested by the corresponding diagnostic test, but they are not the same questions or even necessarily the same types of questions. Therefore if you do poorly on a sample test it is important for you to review those sections of the recommended texts that cover the topic areas which caused you difficulty. Merely learning how to work the sample questions in those topics is no guarantee of success when you take the actual diagnostic test.

The Basic Algebra Exam

The material covered by this exam is generally covered in a high school Algebra I course. The topic areas are:

I. Arithmetic
II. Polynomials
III. Linear Equations and Inequalities
IV. Quadratic Equations
V. Graphing
VI. Rational Expressions
VII. Exponents and Square Root
VIII. Geometric Measurement
IX. Word Problems

If you wish to consult a reference in addition to your high school text, several good ones are readily available. Two of these are:

1. Introductory Algebra, by Keedy & Bittinger published by Addison-Wesley.
2. Beginning Algebra, by McKeague published by Academic Press.

The Intermediate Algebra Exam

The material tested by this exam is generally covered in a high school Algebra II course. The topic areas are:

I. Elementary Numeric and Algebraic Operations
II. Rational Expressions
III. Exponents and Radicals
IV. Linear Equations; Inequalities; Absolute Value
V. Polynomials; Quadratic Equations
VI. The Coordinate Plane and Graphing
VII. Functions and Logarithms
VIII. Word Problems

If you wish to consult a reference in addition to your high school text, several good ones are readily available. Two of these are:

1. Intermediate Algebra, by Keedy & Bittinger published by Addison-Wesley.
2. Intermediate Algebra, by Lial & Miller published by Scott, Foresman & Co.

The Precalculus Exam

The material tested by this exam is generally covered in a high school Algebra III or precalculus course. Some of the topic areas have the same names as those on the algebra exams. However, you can expect the questions on the Precalculus Exam to be more difficult. The topic areas are:

I. Elementary Operations
II. Exponents and Radicals
III. Linear Equations and Inequalities
IV. Polynomials and Polynomial Equations
V. Functions
VI. Trigonometry
VII. Logarithmic and Exponential Functions
VIII. Word Problems

If you wish to consult a reference in addition to your high school text, several good ones are readily available. Two of these are:

1. College Algebra: A Functions Approach by Keedy & Bittinger, published by Addison-Wesley.
2. Functions and Graphs by Swokowski, published by Prindle, Weber and Schmidt.

BASIC ALGEBRA

Topic I - ARITHMETIC

1. $10\frac{3}{7} - 4\frac{2}{3} =$

2. $3.28 \times 17.4 =$

3. Express $\frac{5}{16}$ as a decimal.

4. $2.0 - 11.32 =$

5. $\dfrac{\frac{4}{9} + \frac{2}{3}}{\frac{5}{18}} =$

6. $51\frac{3}{4} \div 2.07 =$

7. 17 is what % of 425?

8. 84 is $12\frac{1}{2}\%$ of what number?

Topic II - POLYNOMIALS

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

2. Factor completely: $4x^2 - 9y^2$

3. If $x = -2$, then $-x^4 + x^2 + x - 4 =$

4. $(3x-2y)^2 =$

5. Factor completely: $2b^2 + 3b - 2 =$

6. If $x = 2$, then
   $(x^2+3x+1) - (2x^2 - x - 1) =$

7. Multiply and simplify:
   $(a-2)(b+3) - 2b(a-1) =$

8. Multiply:
   $(x^2 - 3x+5)(2x+3) =$

Topic III - LINEAR EQUATIONS AND INEQUALITIES

1. Solve for x:

$$\frac{3x + 5x}{5} = 6 + 3x$$

2. Solve for x:

$$2x - b = c$$

3. Solve for x:

$$\frac{5}{2x - 3} - \frac{8}{3 - 2x} = 1$$

4. Solve the system of 2 equations for x and y:

$$\left\{ \begin{array}{r} x = 2y \\ 4x - 3y = 3 \end{array} \right\}$$

5. Solve the system of 2 equations for x and y:

$$\left\{ \begin{array}{r} 2x + y = 4 \\ 3x - y = 1 \end{array} \right\}$$

6. Solve for x: $2x - 5x < 5$

7. Solve for x:

$$4 - 1\frac{1}{2}x \geq 2\frac{3}{4} - 2x$$

8. Solve for x:

$$|2x-1| < 3$$

Topic IV - QUADRATIC EQUATIONS

1. Solve for x:

$$(x - \frac{3}{2})^2 = 5$$

2. Solve for x:

$$(x-2)(x+3) = 0$$

3. Solve for x:

$$3x^2 + 7x = 13x$$

4. Solve for x:

$$x(2x+5) = 7$$

5. Solve for x:

$$x^2 + 3x - 1 = 0$$

6. Solve for x by completing the square:

$$x^2 + 6x = 1$$

7. Solve for x:

$$x^4 - 6x^2 + 8 = 0$$

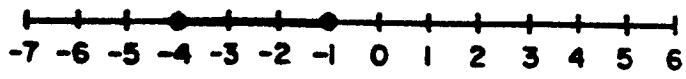
8. Solve for x:

$$x - 5 = \frac{6}{x}$$

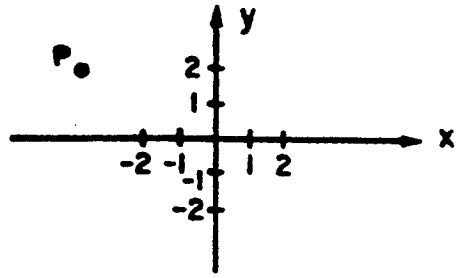
Topic V - GRAPHING

1. Graph the point (-3,5)

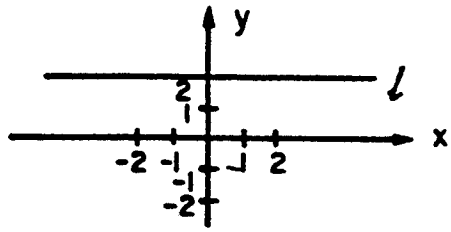
2. Express the graph shown to the right in interval notation.



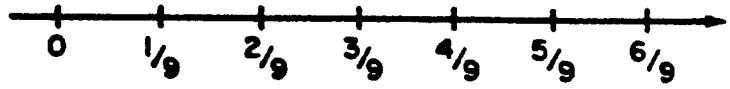
3. If (a,b) denotes the coordinates of the point P shown in the graph to the right, then what is the sign of a - b?



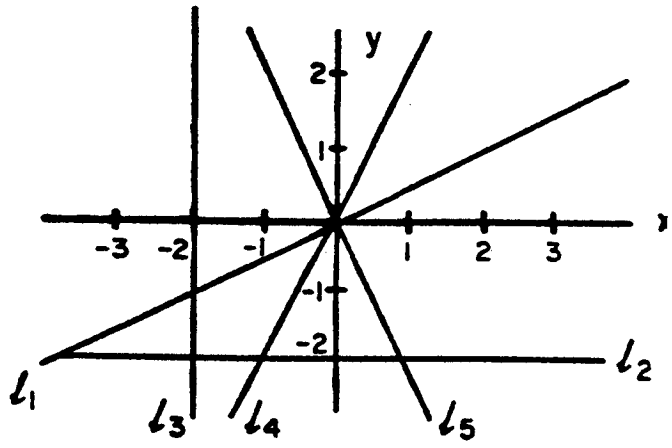
4. Give the equation of line ℓ shown in the graph to the right.



5. Graph $\frac{5}{13}$ on the number line to the right.



6. Which of the lines shown to the right could be a portion of the graph of the equation y = -2x ?



7. Graph the inequality $-4 \leq 3x \leq -2$.

8. Graph the line given by the equation $x = 3y + 6$.

Topic VI - RATIONAL EXPRESSIONS

1. If $x = -1$ and $y = 1$, then

$$\frac{xy^2 - 2x}{3x^2 - xy} =$$

2. Simplify $\frac{(2x+1)(x-4)}{2x - 8}$

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

4. Simplify $\frac{xy^2 + x^2y + x^4y^3}{xy}$

5. Add and simplify $\frac{1}{x + 1} + \frac{1}{x - 1}$

6. Subtract and simplify $\frac{3x - 1}{x + 3} - \frac{1}{x + 2}$

7. Subtract and simplify

$$\frac{x - 2y}{2x + 2y} - \frac{y^2 - 2xy}{x^2 - y^2}$$

8. Perform the indicated operations and simplify

$$\frac{\frac{2}{a} + \frac{1}{4a}}{a + \frac{a}{4}}$$

Topic VII - EXPONENTS AND SQUARE ROOTS

1. Evaluate $\frac{3^2}{3^5}$

2. Write in power form with a single base and exponent $2^3 4^5$

3. Evaluate $\frac{(3^4)(4^5)}{(4^3)(3^2)}$

4. Evaluate 3^{-4}

5. Simplify $\sqrt{32}$

6. Expand $(-xy^3)^2$

7. Multiply $(-x^2y^5)(x^2y)$

8. Simplify $\sqrt{4x^4}$

9. Simplify $\sqrt{x^6}$

10. Simplify $\sqrt{16x^2 + 36y^2}$

11. Simplify $\sqrt{a^2 - 2ab + b^2}$

12. Simplify $\frac{(5ab^2)(2a^3b)^2}{a^3b^2}$

13. Simplify and express without negative exponents

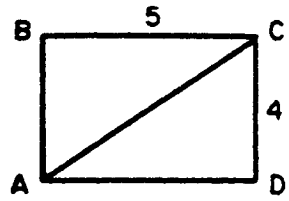
$$\frac{x^{-2}y^2z}{x^{-1}y^{-2}z}$$

14. Simplify and express without negative exponents

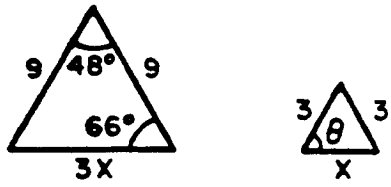
$$(x^4y^{-3})(x^{-7}y^2)^{-1}$$

Topic VIII - GEOMETRIC MEASUREMENT

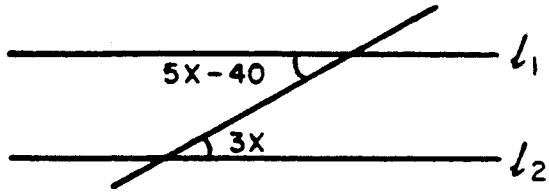
1. In rectangle ABCD shown to right find the length of $\overline{AC}$



2. Find the measure in degrees of angle θ shown in the figure to the right.

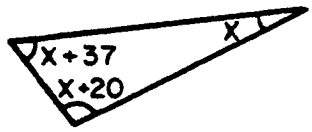


3. In the figure shown to the right line ℓ_1 is parallel to line ℓ_2. Find x.

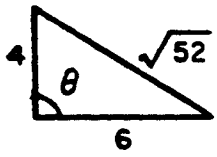


4. Find x in the figure shown to the right.

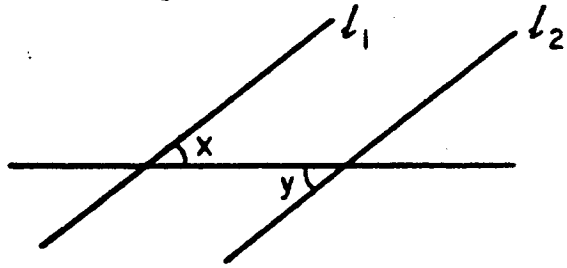
5. Find x in the figure shown to the right.



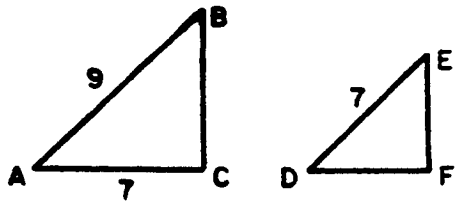
6. Find the degree measure of angle θ shown in the figure to the right.



7. In the figure shown to the right, line ℓ_1 is parallel to line ℓ_2. If $x + y = 80^\circ$ then $x = ?$



8. In the figure shown to the right ΔABC is similar to ΔDEF. Find the length of segment $\overline{BF}$.



Topic IX - WORD PROBLEMS

1. The length of a rectangle is 3 times its width plus 4 inches. The area is 54 square inches. How wide is the rectangle?

2. An amount of money is divided into 15 equal shares. Four shares together make $200. How much was the original amount of money?

3. An item is sold for $138. If the sale price of the item is 15% over cost, what is the cost of the item?

4. x is to 2 as y is to 7. If $x = 3\frac{1}{2}$ then find y.

5. A number is divided by 5 and then multiplied by 7. The result is 14. How much was the number?

6. The perimeter of a rectangle is 6 times its length. What is the ratio of the length to width?

7. Veronica leaves home walking at 3 miles/hr. One half an hour later her mother goes after her walking at 4 miles/hr. How long will it take her mother to catch up with Veronica?

8. A company currently owns a copy machine that takes 5 hours to print 4,000 copies of a newsletter. If the company buys a second copier that prints 1,400 copies in two hours, and uses both machines, how long will it take to print the 4,000 newsletters?

INTERMEDIATE ALGEBRA

Topic I - ELEMENTARY NUMERIC AND ALGEBRAIC OPERATIONS

1. Express in scientific notation
$4.2 \times 10^{6} \times 1.3 \times 10^{-6}$

2. Express in scientific notation
$$\frac{1.38 \times 10^{-4}}{184 \times 10^{-7}}$$

3. Express in scientific notation
$9.60 \times 10^{-2} + 5.7 \times 10^{-3}$

4. Perform the indicated operations and reduce to lowest terms
$$\frac{\frac{4}{9} + \frac{2}{3}}{\frac{5}{18}}$$

5. Simplify $\frac{8}{x} \cdot \frac{x^3 y^2}{36} \cdot \frac{3}{y^2}$

6. Add and simplify
$3((x-y)+4) - 4(2+(y-x))$

7. Add $\frac{7}{c} + d$

8. 17 is what % of 425 ?

Topic II - RATIONAL EXPRESSIONS

1. Add and simplify
$$\frac{x^2 - xy}{x^2 + xy} + 2x =$$

2. Add and simplify
$$\frac{xy^3}{x - y} + \frac{xy^4 + y^5}{y^2 - x^2}$$

3. Simplify
$$\frac{x - y}{(x^2+1)} \cdot \frac{4y^2}{(y^2-x^2)}$$

4. Subtract and simplify
$$\frac{x+3}{x(x^2-1)} - \frac{1}{x^2(x+1)}$$

5. Subtract and simplify
$$\frac{3x^2y}{xy} - \frac{4xy^2}{\frac{1}{y}}$$

6. Subtract and simplify
$$\frac{3x - 1}{(x-1)(x+1)} - \frac{x + 3}{(x+1)(x+2)} - \frac{1}{x + 2}$$

7. Perform the indicated operations and simplify
$$\frac{\frac{2}{a} + \frac{1}{4a}}{a + \frac{a}{4}}$$

8. Perform the indicated operations and simplify
$$\frac{\frac{1}{x + 1} - \frac{1}{x + 2}}{\frac{1}{x + 2} - \frac{1}{x + 3}}$$

Topic III - EXPONENTS AND RADICALS

1. Evaluate $\frac{2^3(-1)^4}{2^{-1}}$

2. Evaluate $32^{-3/5}$

3. Simplify $\sqrt{10} \cdot \sqrt{15}$

4. Simplify $\sqrt{(u^2-v^2)(u+v)}$, $u > v > 0$

5. Simplify $\sqrt{16x^2+36y^2}$

6. Simplify $\frac{5y^{-2}}{10y^{-4}}$

7. Simplify $\frac{(5ab^2)(2a^3b)^2}{a^3b^2}$

8. Simplify $(x^4y^{-3})(x^{-7}y^2)^{-1}$

9. Simplify $x^{-3}y^4x^7$

10. Simplify $\left(\frac{9^4x^{3/2}y^{4/3}}{81x^{-1/2}y^{-2}}\right)^{1/2}$, $y > 0$

11. Simplify $\frac{w^{3a+2}}{w^{5-a}}$

12. Simplify $\frac{x^{-2}y^3z}{x^{-1}y^{-2}z}$

13. Simplify and express without radical signs

$\sqrt[3]{x}\ \sqrt[6]{x}$

14. Simplify and express without radical signs

$\sqrt[3]{\sqrt{a^5}}$

Topic IV - LINEAR EQUATIONS; INEQUALITIES; ABSOLUTE VALUES

1. Solve the system of equations for x and y.

$3x + 5y = -7$
$4x - 2y = 8$

2. Solve the system of equations for x and y.

$5x = 3y$
$3x + 2y = 21$

3. Solve for a: $\sqrt{a+1} - 2 = 2$

4. Solve for x: $\frac{2}{x} - \frac{2}{2x+1} = \frac{1}{x+1}$

5. If a = -2, evaluate:

$|a-1| - |-a| + 1$

6. Solve for x:

$|3-5x| \leq 12$

7. Solve for x:

$|x+5| \geq 1$

8. Solve for x:

$x^2 + 2x - 3 \geq 0$

Topic V - POLYNOMIALS; QUADRATIC EQUATIONS

1. Multiply the following:

   $(3x^2-2x+1)(x^2-5x)$

2. Factor completely:

   $a^2 - 9a^2b^2$

3. Factor completely:

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

4. Factor completely:

   $m^4 + m^2 - 2$

5. Solve by completing the square:

   $x^2 - 3x = 4$

6. Solve for x:

   $2x^2 + 4x + 1 = 0$

7. Solve for y:

   $y - 4y^{1/2} - 5 = 0$

8. Solve for x:

   $\sqrt{2x-5} - \sqrt{x-2} = 2$

9. If $i = \sqrt{-1}$, simplify:

   $$\frac{i}{4+3i}$$

10. Solve for z:

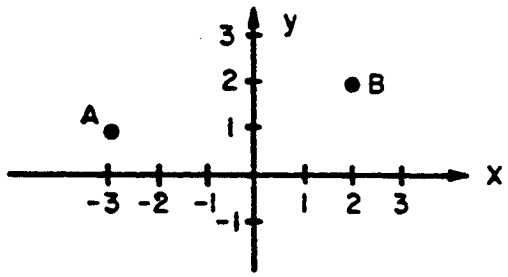
    $z^2 - 2z + 1 = -4$

Topic VI - THE COORDINATE PLANE AND GRAPHING

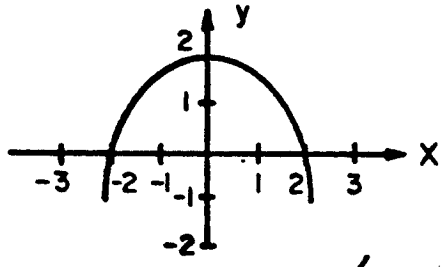
1. Find the equation of the line which passes through the points (1,2) and (-1,4).

2. Find the equation of the line with slope 4 which passes through the point (0,-2).

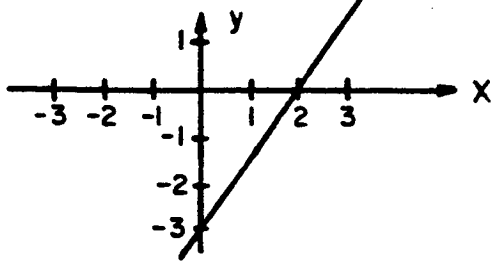
3. Find the distance between points A and B shown in the graph to the right.



4. Find the quadratic function whose graph is shown in the figure to the right.



5. Find the slope of the line, ℓ, shown in the figure to the right.



6. Graph the equation $x = -5$.
7. Graph the equation $2x - 3y + 4 = 0$.
8. Graph the curve $y = 2x^2 + 1$.

Topic VII - FUNCTIONS AND LOGARITHMS

1. If $f(u) = 3u^2 - 4u + 5$, then $f(u-2) = ?$

2. If $f(h) = h + \frac{2}{h} + 1$, find all values of k so that $f(k) = 4$.

3. Solve for x:

$$5^{3x} = 1$$

4. Solve for b:

$$\log_b 125 = 3$$

5. Evaluate $\log_{81} 27$

6. Evaluate $\log_{1/3} 9$

7. Solve for x:

$$\log_{10}(3x+1) = 3$$

8. Simplify $\log xy - \log x$

Topic VIII - WORD PROBLEMS

1. You can exchange \$2 for £1.3. How many pounds (£) can you get for \$5 ?

2. The side of a square is tripled. How much does the area change?

3. 35% of a number is 245. What is the number?

4. 2 is to 7 as 5 is to ?

5. The sum of two numbers is 2. Their product is -3. What are the numbers?

6. A rectangle has an area of 12 square inches and a perimeter of 15 inches. What are the dimensions of the rectangle?

7. A triangle has an area of 15 square inches. Its base in increased by 2 inches and the area becomes 25 square inches. What was the length of the original base?

8. What integral power of 10 gives the best approximation to

$$\frac{10^{1.02} \times 10^{-1.01}}{995} + 10^{-5} \; ?$$

PRECALCULUS

Topic I - ELEMENTARY OPERATIONS

1. Multiply and simplify

$$(x+1)(x^2-x+1)$$

2. Perform the indicated operations and simplify

$$\frac{\frac{2}{x} - 1}{x^2 - 4}$$

3. Simplify $\frac{5u^2}{v^3} \frac{-4v}{uv} (3v^2)$

4. Subtract and simplify

$$\frac{12}{x^2 - 4} - \frac{3 - x}{x^2 + 2x}$$

5. Add and simplify

$$\frac{1}{(a-b)(a+2b)} + \frac{1}{(a+2b)(a-3b)} + \frac{1}{(a-3b)(a-b)}$$

6. Perform the indicated operations and simplify

$$\left(\frac{x}{y} - \frac{y}{x}\right)^{-1}$$

7. Divide and simplify

$$\frac{\frac{a^2 b}{a - b}}{\frac{a + b}{a^2 - b^2}}$$

8. Perform the indicated operations and simplify

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

Topic II - EXPONENTS AND RADICALS

1. Evaluate $32^{-3/5}$

2. Simplify $\sqrt{10}\sqrt{15}$

3. Simplify $(u^2-v^2)(u+v)$, $u > v > 0$

4. Simplify $\sqrt{16x^2+36y^2}$

5. Simplify $\dfrac{(5ab^2)(2a^3b)^2}{a^3b^2}$

6. Simplify $\dfrac{x^{-2}y^3z}{x^{-1}y^{-2}z^0}$

7. Simplify $\dfrac{x^{u^2-3}}{x^{u-3}}$

8. Simplify $(x^{a-1})^{p+2}$

9. Simplify $\dfrac{x^{4/3}y^{3/4}}{4x^0y^5}$

10. Simplify $\dfrac{9^4x^{3/2}y^{5/2}}{81^6x^{-1/2}y^{-1}}$

11. Simplify $(-27x^{12}y^{-18})^{-2/3}$

12. Simplify $\sqrt[4]{a^6} - 2a\sqrt{a}$, $a > 0$

13. Simplify and express without radical signs

$$\frac{\sqrt{x}}{11\sqrt{x}}$$

14. Simplify $\sqrt{18} - 3\sqrt{8} + \sqrt{50}$

Topic III - LINEAR EQUATIONS AND INEQUALITIES

1. Solve for x:

$x = \frac{m}{n}x + 2$

2. Solve for a:

$\sqrt{a-1} - 2 = 2$

3. Solve for x:

$\frac{2}{x} - \frac{2}{2x+1} = \frac{1}{x+1}$

4. Solve the system of equations for x and y

$3x + 5y = -7$
$4x - 2y = 8$

5. Solve the system of equations for x and y:

$5x = 3y$
$3x + 2y = 21$

6. If $a = -2$ then evaluate:

$|a-1| - |-a| + 1$

7. Solve for x:

$|4-3x| \leq 7$

8. Solve for x:

$x^2 + 2x - 3 > 0$

Topic IV - POLYNOMIALS AND POLYNOMIAL EQUATIONS

1. Solve for x:
$3x + 5x^{1/2} - 28 = 0$

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

3. Solve for x:
$(x-1)(x-2) = 1$

4. Solve for x by completing the square
$4x^2 + 3x - 1 = 0$

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

6. Divide $x^3 - 10x + 3$ by $x + 3$

7. Verify that 2 is a root of the polynomial
$6x^3 - 19x^2 + 9x + 10$
and factor this polynomial completely.

8. Find all values of a so that polynomial
$ax^2 + 5x + 2$
has two distinct real roots.

Topic V - FUNCTIONS

1. $f(u) = \frac{-3u^2 + 2u + 3}{au^2 + bu + 1}$. Find f(0).

2. $f(x) = -\frac{3}{x-4}$. Find $f(\frac{1}{x+2})$ and simplify.

3. $f(x) = 3x + 1$, $g(x) = x^2 - 1$.
Find f(g(x)) and g(f(x)).

4. If $f(x) = \frac{2x + 1}{x - 1}$, for which x does $f(x) = -5$?

5. $f(t) = \frac{2t - 1}{t + 3}$. Find $\frac{5}{f(3)}$.

6. Graph the function $f(x) = \frac{1}{x - 3}$.

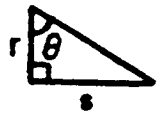
7. Graph the function $h(x) = |x^2-1|$.

8. Find the domain and range of the function
$g(x) = \sqrt{10+2x-x^2}$

Topic VI - TRIGONOMETRY

1. Given θ as shown in the figure to the right, find $\sin \theta$.

2. Given θ as shown in the figure to the right, find $\tan \theta \cos \theta$.



3. Verify the identity:

$\tan(\pi - x) = -\tan x$

4. Verify the identity:

$\sec y - \cos y = \tan y \sin y$

5. Verify the identity:

$$\tan x + \tan y = \frac{\sin(x + y)}{\cos x \cos y}$$

6. Find all x satisfying:

$\tan^2 2x = 3, \quad 0 \leq x \leq \pi$

7. Graph the equation:

$y = \cos 3x$

8. Graph the equation:

$y = 3 \sin \frac{x}{2}$

Topic VII - LOGARITHMIC AND EXPONENTIAL FUNCTIONS

1. Solve for x:

$\log_a x = b$

2. Solve for u:

$3^u = 4$

3. Evaluate $\log_{49} \sqrt{7}$

4. Evaluate $\log_2 (\frac{1}{32} \times 4^{-9})$

5. Which of the following is larger?

$5 - \log_2 60, \quad 3 - \log_2 20$

6. Simplify the following:

$\log x^2 y - \frac{1}{2} \log x + 3 \log y$

7. Graph the equation:

$y = (\frac{1}{2})^x$

8. Graph the equation:

$y = |\log_{10} x|$

Topic VIII - WORD PROBLEMS

1. Sue is 2 years older than John. 15 years ago she was twice as old as he was. If x and y are the ages of Sue and John now, give a system of equations that could be solved to find x and y.

2. A 3 X 5 photograph is enlarged so that its width measures 7". What is the length of the enlargement?

3. If the circumference of a circle is multiplied by 5, how much is the area increased?

4. Two numbers add to 17, and 7 times the first minus five times the second is 3. What are the numbers?

5. A positive number is taken to the $\frac{1}{3}$ power and the result is squared. The final answer is 9. What is the original number?

6. The sine of twice an angle is $\frac{\sqrt{2}}{2}$. If the angle is between 0 and 2π what are its possible values?

7. The price of a plane ticket has been increased by 15% to \$172.50. What was the cost before the increase?

8. The radius of a circle is increased by 20%. What is the percent increase in area?

BASIC ALGEBRA

SOLUTIONS

I. ARITHMETIC

1. $5\frac{16}{21}$
2. 57.072
3. .3125
4. -9.32
5. 4
6. 25
7. 4%
8. 672

II. POLYNOMIALS

1. $2x^2 - 7x - 15$
2. $(2x-3y)(2x+3y)$
3. -18
4. $9x^2 - 12xy + 4y^2$
5. $(2b-1)(b+2)$
6. 6
7. $-ab + 3a - 6$
8. $2x^3 - 3x^2 + x + 15$

III. LINEAR EQUATIONS AND INEQUALITIES

1. $x = -\frac{30}{7}$
2. $x = \frac{b + c}{2}$
3. $x = 8$
4. $x = \frac{6}{5}$, $y = \frac{3}{5}$
5. $x = 1$, $y = 2$
6. $x > -\frac{5}{3}$
7. $x \geq -2\frac{1}{2}$
8. $-1 < x < 2$

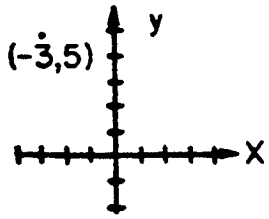
IV. QUADRATIC EQUATIONS

1. $x = \frac{3 \pm 2\sqrt{5}}{2}$
2. $x = 2, -3$
3. $x = 0, 2$
4. $x = -\frac{7}{2}$, $x = 1$
5. $x = \frac{-3 \pm \sqrt{13}}{2}$
6. $x = -3 \pm \sqrt{10}$
7. $x = \pm 2$, $x = \pm\sqrt{2}$
8. $x = -1, x = 6$

BASIC ALGEBRA

SOLUTIONS

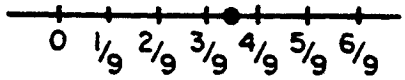
V. GRAPHING

1. 

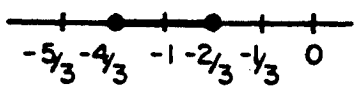
2. $-4 \leq x \leq 1$

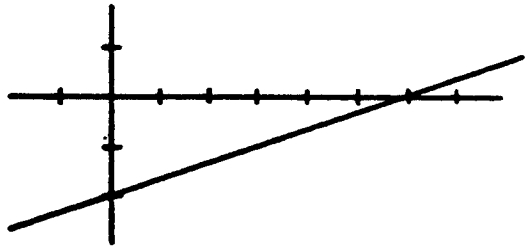
3. Negative

4. $y = 2$

5. 

6. ℓ_5

7. 

8. 

VI. RATIONAL EXPRESSIONS

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

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

3. $x - 2$

4. $y + x + x^3y^2$

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

6. $\frac{3x^2 + 4x - 5}{x^2 + 5x + 6}$

7. $\frac{x}{2(x-y)}$

8. $\frac{9}{5a^2}$

VIII. EXPONENTS AND SQUARE ROOTS

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

2. 2^{13}

3. 144

4. $\frac{1}{81}$

5. $4\sqrt{2}$

6. x^2y^6

7. $-x^4y^6$

8. $2x^2$

9. $|x^3|$

10. $2\sqrt{4x^2 + 9y^2}$

11. $|a-b|$

12. $20a^4b^2$

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

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

BASIC ALGEBRA

SOLUTIONS

VIII. GEOMETRIC MEASUREMENT

1. $\sqrt{41}$
2. $\theta = 66^\circ$
3. $x = 20^\circ$
4. $x = 30^\circ$
5. $x = 41^\circ$
6. $\theta = 90^\circ$
7. $x = 40^\circ$
8. $x = 5\frac{4}{9}$

IX. WORD PROBLEMS

1. $\frac{-2 + \sqrt{166}}{3}$
2. \$750
3. \$120
4. $y = 12\frac{1}{4}$
5. 10
6. $\frac{1}{2}$
7. $1\frac{1}{2}$ hours
8. $2\frac{2}{3}$ hours

INTERMEDIATE ALGEBRA

SOLUTIONS

I. ELEMENTARY NUMERIC AND ALGEBRAIC OPERATIONS

1. 5.46
2. 7.5
3. 1.017×10^{-1}
4. 4
5. $\frac{2}{3}x^2$
6. $7x - 7y + 4$
7. $\frac{7 + cd}{c}$
8. 4%

II. RATIONAL EXPRESSIONS

1. $\frac{x - y + 2x^2 + 2xy}{x + y}$
2. y^3
3. $\frac{-4y^2}{(x^2+1)(x+y)}$
4. $\frac{x + 1}{x^2(x-1)}$
5. $3x - 4xy^3$
6. $\frac{1}{x - 1}$
7. $\frac{9}{5a^2}$
8. $\frac{x + 3}{x + 1}$

III. EXPONENTS AND RADICALS

1. 16
2. $\frac{1}{8}$
3. $5\sqrt{6}$
4. $(u+v)\sqrt[4]{u-v}$
5. $2\sqrt{4x^2+9y^2}$
6. $\frac{y^2}{2}$
7. $20a^4b^2$
8. $\frac{x^{11}}{y^5}$
9. x^4y^4
10. $9xy^{5/3}$
11. w^{4a-3}
12. $\frac{y^5}{x}$
13. $x^{1/2}$
14. $a^{5/6}$

INTERMEDIATE ALGEBRA

SOLUTIONS

IV. LINEAR EQUATIONS; INEQUALITIES; ABSOLUTE VALUES

1. $x = 1, \quad y = -2$

2. $x = \frac{63}{19}, \quad y = \frac{105}{19}$

3. $a = 15$

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

5. 2

6. $\{x: \frac{-9}{5} \leq x \geq 3\}$

7. $\{x: x \leq -6 \text{ or } x \geq -4\}$

8. $\{x: x \leq -3 \text{ or } x \geq 1\}$

V. POLYNOMIALS; QUADRATIC EQUATIONS

1. $3x^4 - 17x^3 + 11x^2 - 5x$

2. $a^2(1-3b)(1+3b)$

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

4. $(m-1)(m+1)(m^2+2)$

5. $x = 4, \quad x = -1$

6. $x = \frac{-2 \pm \sqrt{2}}{2}$

7. $y = 25$

8. $x = 27$

9. $\frac{4i + 3}{25}$

10. $x = 1 \pm 2i$

VI. THE COORDINATE PLANE AND GRAPHING

1. $y = -x + 3$

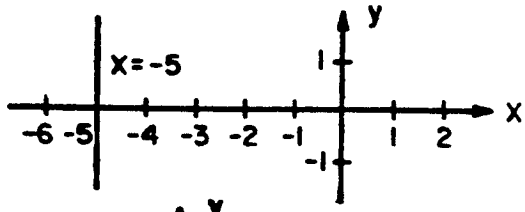
2. $y = 4x - 2$

3. $\sqrt{26}$

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

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

6.



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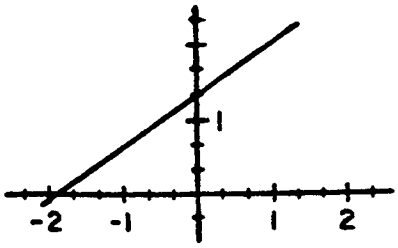

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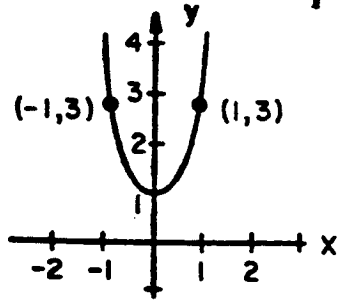


INTERMEDIATE ALGEBRA

SOLUTIONS

VII. FUNCTIONS AND LOGARITHMS

1. $f(u-2) = 3u^2 - 16u + 25$

2. $k = 1, \quad k = 2$

3. $x = 0$

4. $b = 5$

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

6. -2

7. $x = 333$

8. $\log y$

VIII. WORD PROBLEMS

1. £3.25

2. 9 times as large

3. 700

4. 17.5

5. -1 and 3

6. $\ell = \frac{15 + \sqrt{33}}{4}, \quad w = \frac{15 - \sqrt{33}}{4}$

7. $b = 3$

8. -3

PRECALCULUS

SOLUTIONS

I. ELEMENTARY OPERATIONS

1. $x^3 + 1$

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

3. $\frac{-60u}{v}$

4. $\frac{x^2 + 7x + 6}{x(x+z)(x-z)}$

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

6. $\frac{xy}{x^2 - y^2}$

7. a^2b

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

II. EXPONENTS AND RADICALS

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

2. $5\sqrt{6}$

3. $(u+v)\sqrt{u-v}$

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

5. $20a^4b^2$

6. $\frac{y^5z}{x}$

7. x^{u^2-u}

8. $x^{ap-p+2a-2}$

9. $\frac{x^{4/3}}{4y^{17/4}}$

10. $\frac{x^2y^{7/2}}{9^8}$

11. $\frac{y^{12}}{9x^8}$

12. $-a\sqrt{a}$

13. $x^{9/22}$

14. $2\sqrt{2}$

III. LINEAR EQUATIONS AND INEQUALITIES

1. $\frac{2n}{n - m}$

2. $a = 17$

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

4. $x = 1, \quad y = -2$

5. $x = \frac{63}{19}, \quad y = \frac{105}{19}$

6. 2

7. $\{x: -1 \leq x \leq \frac{11}{3}\}$

8. $\{x: x < -3 \text{ or } x > 1\}$

PRECALCULUS

SOLUTIONS

IV. POLYNOMIALS AND POLYNOMIAL EQUATIONS

1. $x = \frac{49}{9}$

2. $x = \frac{1 \pm \sqrt{3}}{2}$

3. $x = \frac{3 \pm \sqrt{5}}{2}$

4. $x = -1, \quad x = \frac{1}{4}$

5. $x = 27$

6. $x^2 - 3x - 1 + \frac{6}{x + 3}$

7. $(x-2)(2x+1)(3x-5)$

8. $\{a: a < \frac{25}{8}\}$

V. FUNCTIONS

1. $f(0) = 3$

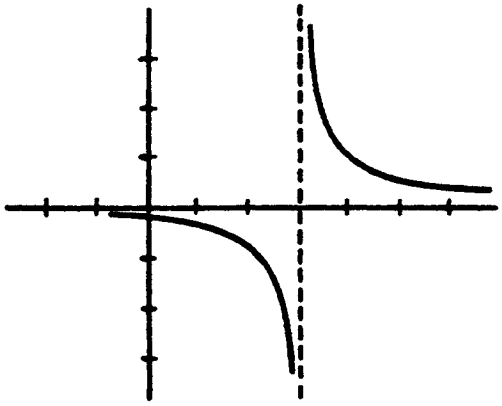
2. $\frac{3x + 6}{4x + 7}$

3. $f(g(x)) = 3x^2 - 2$
   $g(f(x)) = 9x^2 + 6x$

4. $x = \frac{4}{7}$

5. 6

6.



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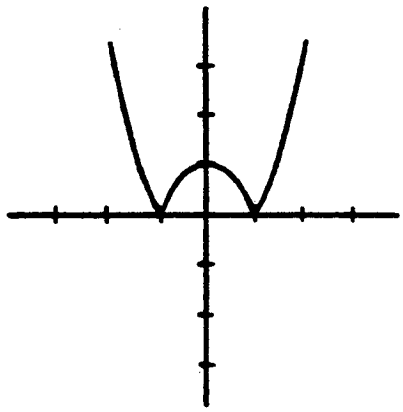


8. Domain = $\{x: 1 - \sqrt{11} \leq x \leq 1 + \sqrt{11}\}$; Range = $\{y: 0 \leq y \leq \sqrt{11}\}$

PRECALCULUS

SOLUTIONS

VI. TRIGONOMETRY

1. $\sin\theta = \dfrac{\sqrt{\mu^8 - 1}}{\mu^4}$

2. $\dfrac{s}{\sqrt{r^2+s^2}}$

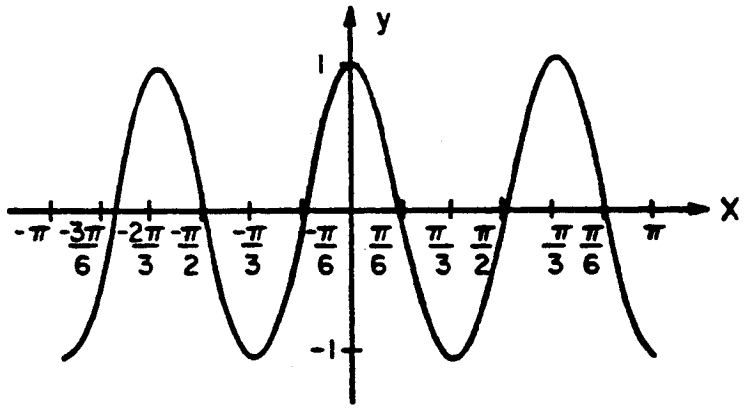
3. $\tan(\pi - x) = \dfrac{\sin(\pi-x)}{\cos(\pi-x)} = \dfrac{\sin x}{-\cos x} = -\tan x$

4. $\sec y - \cos y = \dfrac{1}{\cos y} - \cos y = \dfrac{1 - \cos^2 y}{\cos y} = \dfrac{\sin^2 y}{\cos y} = \tan y \sin y$

5. $\tan x + \tan y = \dfrac{\sin x}{\cos x} + \dfrac{\sin y}{\cos y} = \dfrac{\sin x \cos y + \sin y \cos x}{\cos x \cos y} = \dfrac{\sin(x+y)}{\cos x \cos y}$

6. $x = \dfrac{\pi}{6}, \dfrac{\pi}{3}, \dfrac{2\pi}{3}, \dfrac{5\pi}{6}$

7.



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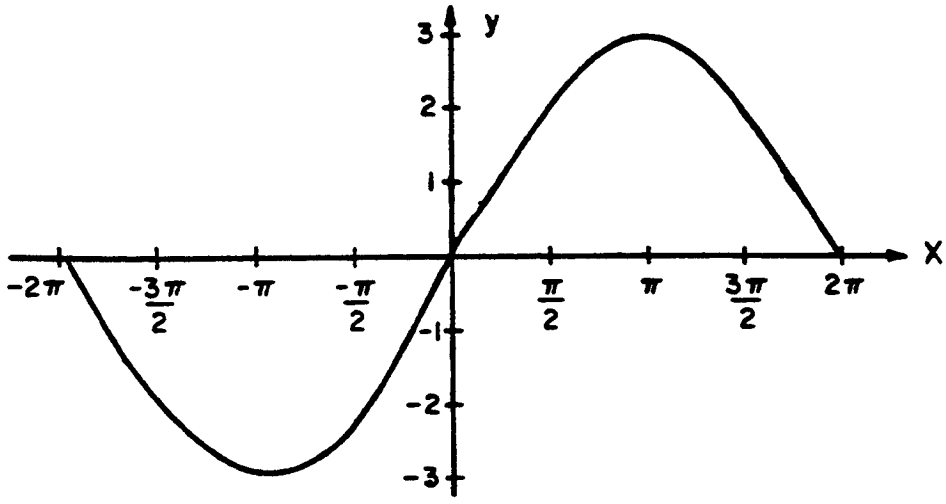


PRECALCULUS

SOLUTIONS

VII. LOGARITHMIC AND EXPONENTIAL FUNCTIONS

1. $x = a^b$

2. $u = \frac{\log 4}{\log 3} \doteq 1.26$

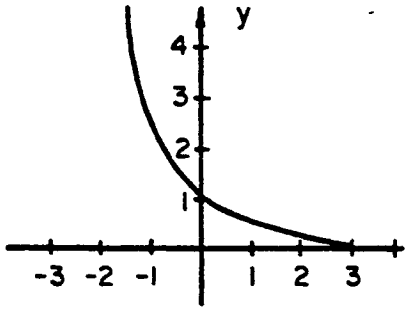
3. $x = \frac{1}{4}$

4. $x = -23$

5. $5 - \log_2 60$

6. $\log(x^{3/2} y^4)$

7.



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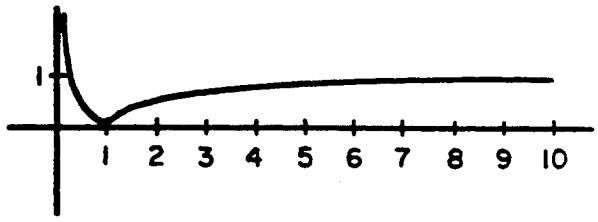

VIII. WORD PROBLEMS

1. $x = y + 2$
   $x - 15 = 2(y-15)$

2. $\ell = 11\frac{2}{3}$

3. 25 times

4. $7\frac{1}{3},\ 9\frac{2}{3}$

5. 27

6. $\theta = \frac{\pi}{8}, \frac{3\pi}{8}, \frac{9\pi}{8}, \frac{11\pi}{8}$

7. \$150.00

8. 44%