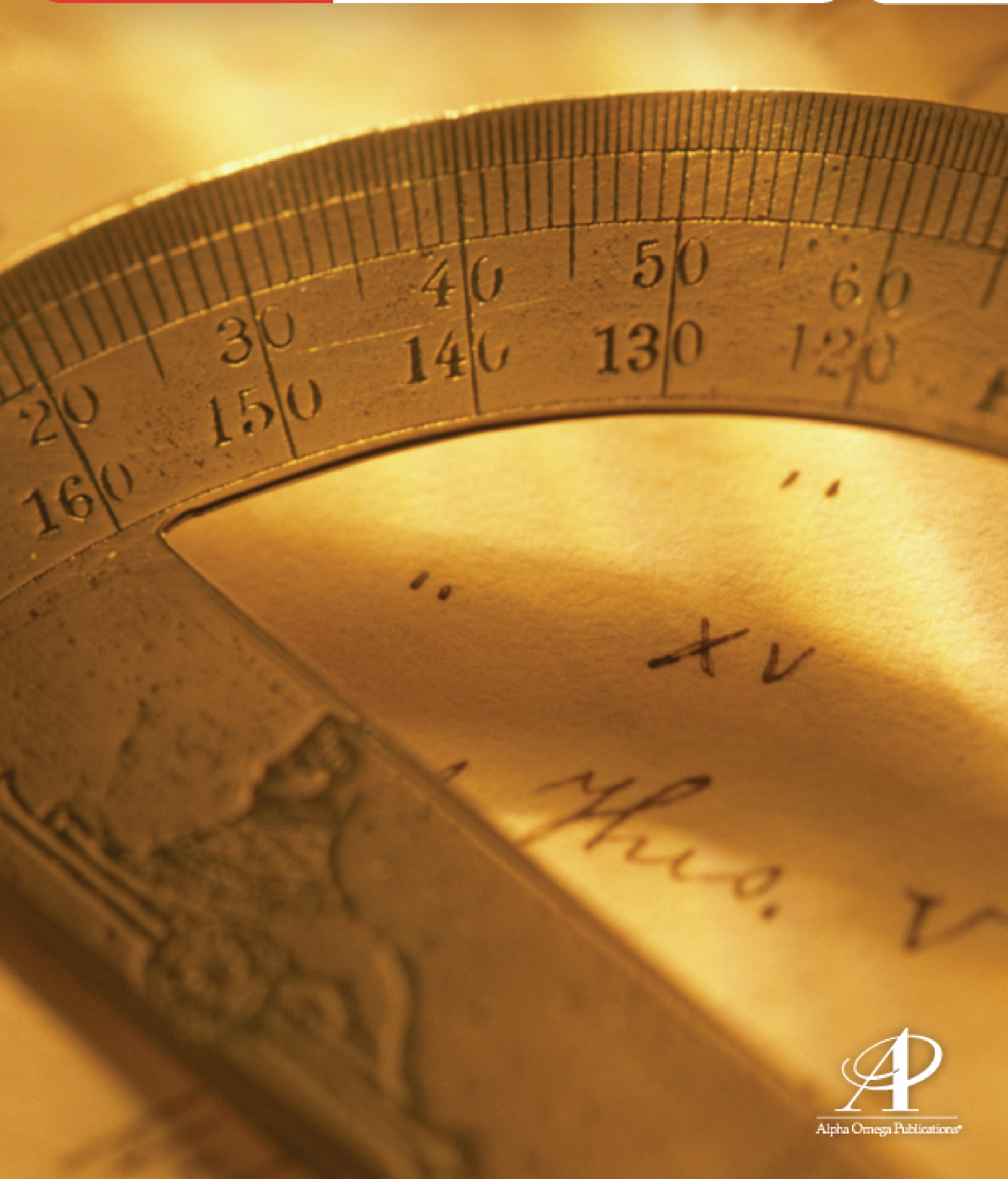
LIFEPAC® Math



Alpha Omega Publications®

MATHEMATICS 1202
FUNCTIONS

CONTENTS

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FUNCTIONS

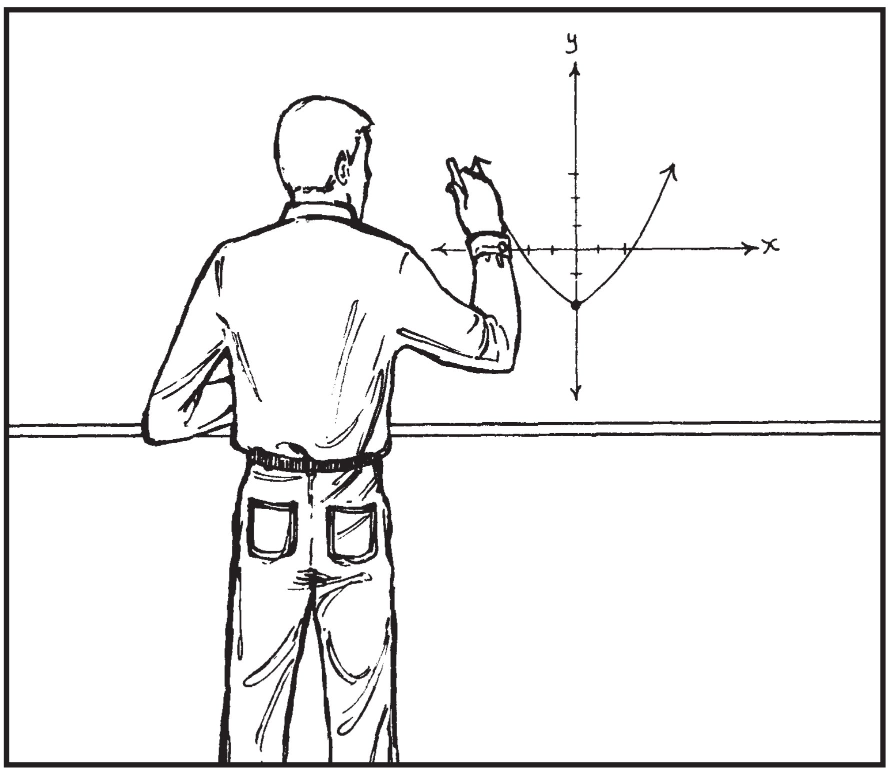
To continue with the concept of functions, we shall first look at the polynomial functions of degrees one and two. Next, higher degree polynomial functions will be introduced. Finally, several special functions will be considered, including the greatest integer function, the exponential function, the logarithmic function, and combinations of these three functions.

OBJECTIVES

Read these objectives. The objectives tell you what you should be able to do when you have successfully completed this LIFEPAC®.

When you have completed this LIFEPAC, you should be able to:

1. Solve and graph linear equations and inequalities.
2. Solve and graph quadratic equations and inequalities.
3. Solve higher degree equations using factor theorems and synthetic division.
4. Solve and graph greatest integer, exponential, and logarithmic functions and function combinations.



I. LINEAR FUNCTIONS

The polynomial functions are a group of functions in the form $y = a_0x^n + a_1x^{n-1} + a_2x^{n-2} + \ldots + a_{n-1}x + a_n$ where $a_0, a_1, a_2, \ldots$ are numerical coefficients and n, a positive integer, is the exponent of the variable x. The number n then becomes the degree of the polynomial.

SOLUTIONS AND GRAPHS

If $a_0 \neq 0$ and $n = 1$, the expression is a *linear equation* or *linear function*. Its degree is one. A linear function in x is one that can be written in the standard form $y = mx + b$, $m \neq 0$, where m and b are constants.

Models of linear functions are $y = 3x + 2$, $x + y = 6$, and $7x = 3y$. For practice, identify a_0, a_1, and n in each of the examples. The graph of a linear function is a straight line. By the definition of a function, a vertical line is not a linear function. Review the definition of a function.

A function can be identified from a graph. If two or more points lie on the same vertical line, then x is double valued and the relation is *not* a function.

REMEMBER?

STUDY THIS EXAMPLE:

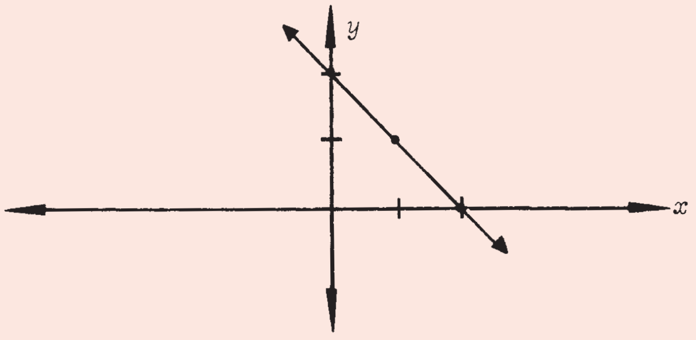
$$x + y = 2$$

$$y = -x + 2$$

Find at least three solutions, such as these

x	y
1	1
0	2
2	0

and locate the solutions as points on the coordinate plane.



A zero of a function is a value of x for which y, the value of the function, is zero. Thus, the zeros of a function are the roots or solutions of $f(x) = 0$.

The zero of the function in the preceding example, or the value of x when $y = 0$, is 2. That is, $f(x) = 0$ when $x = 2$. This value is also called the *x-intercept*. The y-intercept is the value of the second coordinate of the point where the line crosses the y-axis.

A special case of a linear function that we need to consider is of form $y = \frac{x^2 - 9}{x + 3}$. Implied in this rule is that $x \neq -3$; therefore, the domain of this function is the set of all real numbers except $x = -3$. If we exclude $x = -3$, then we may simplify $y = \frac{x^2 - 9}{x + 3}$ in the following manner.

Factoring the numerator, we get

$$y = \frac{(x - 3)(x + 3)}{(x + 3)},$$

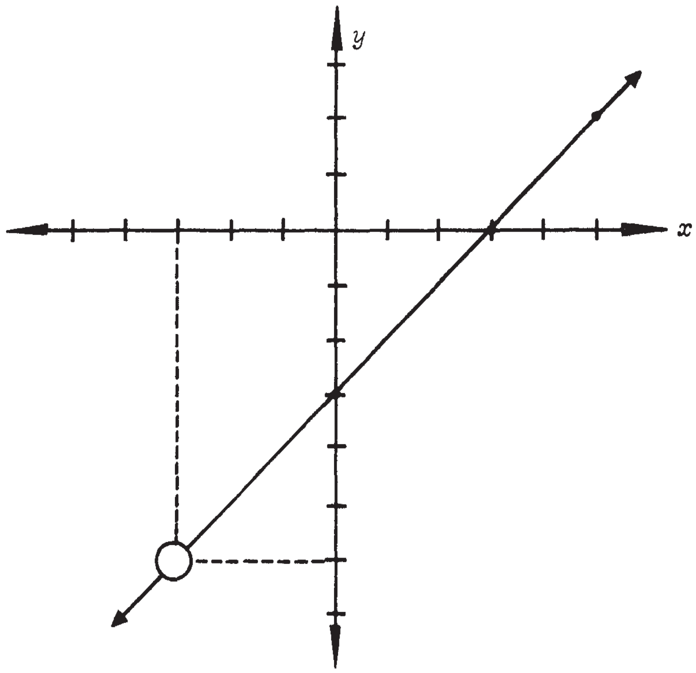
which can be reduced to

$$y = x - 3.$$

Since $y = x - 3$ is a straight line and $x \neq -3$, we have a line with a hole in it. Three solutions are

x	y
5	2
0	-3
3	0

Its graph is shown.



The zero of this function is 3; that is, $f(x) = 0$ when $x = 3$.

You will prove in the calculus that the closer the value of x gets to -3, the closer the function value, y, will get to -6.

GRAPH THE FOLLOWING LINEAR FUNCTIONS BY FINDING THREE SOLUTIONS FOR EACH.

1.1 $F(x) = x + 3$

1.2 $G(x) = 3x - 2$

1.3 $F^{-1}(x)$ if $F(x) = x + 3$

1.4 $g(x) = \frac{3x - 5}{4}$