Course Number

Instructor

Date

Section 3.5 Mathematical Modeling

Objective: In this lesson you learned how to write mathematical models for direct, inverse, and joint variation and how to use the least squares regression feature of a graphing utility to find mathematical models of actual data.

Important Vocabulary Define each term or concept.

Vary directly

Directly proportional

Vary inversely

Sum of square differences

Least squares regression line

I. Introduction (Page 303)

What you should learn
How to use mathematical models to approximate sets of data points

Describe what is meant by "fitting a line to data."

II. Direct Variation (Page 304)

What you should learn
How to write mathematical models for direct variation

When a variable y is directly proportional to a variable x, the **constant of variation** is . . . _____ _____. Another name for the constant of variation is the _____ _____.

Example 1: If y varies directly as x, and y is 6 when x is 4, find the value of y when x is 20.

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III. Direct Variation as *n*th Power (Page 305)

What you should learn
How to write mathematical models for direct variation as an *n*th power

If $y = kx^n$ for some nonzero constant k, then describe the relationship between y and x in two different ways.

Example 2: If y is directly proportional to the third power of x, and y is 750 when x is 10, find the value of y when x is 8.

IV. Inverse Variation (Page 306)

What you should learn
How to write mathematical models for inverse variation

If y varies inversely as x, then y is _____ to x.

If x and y are related by an equation of the form $y = k/x^n$, then y _____ or y _____.

Example 3: If y varies inversely as x, and y is 4 when x is 16, find the value of y when x is 10.

V. Joint Variation (Page 307)

What you should learn
How to write mathematical models for joint variation

If z **varies jointly** as x and y, then z = _____.

Another way to say that z varies jointly as x and y is . . .

Example 4: If z varies jointly as x and y, and if $z = 10$ when $x = 4$ when $y = 15$, find the value of z when $x = 12$ and $y = 7$.

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VI. Least Squares Regression (Page 308)

What you should learn
How to use the least squares regression feature of a graphing utility to find mathematical models

To find the least squares regression line for a set of data, . . .

The correlation coefficient r of a set of data gives a measure of _____. The closer $|r|$ is to 1, the better . . .

Example 5: The numbers of U.S. Air Force personnel p on active duty for the years 1995 through 1999 are shown in the table. Use the regression capabilities of a graphing utility to find a linear model for the data. Let t represent the year with $t = 5$ corresponding to 1995.

Year	1995	1996	1997	1998	1999
p	400	389	379	363	358

(Source: U.S. Department of Defense)

Additional notes

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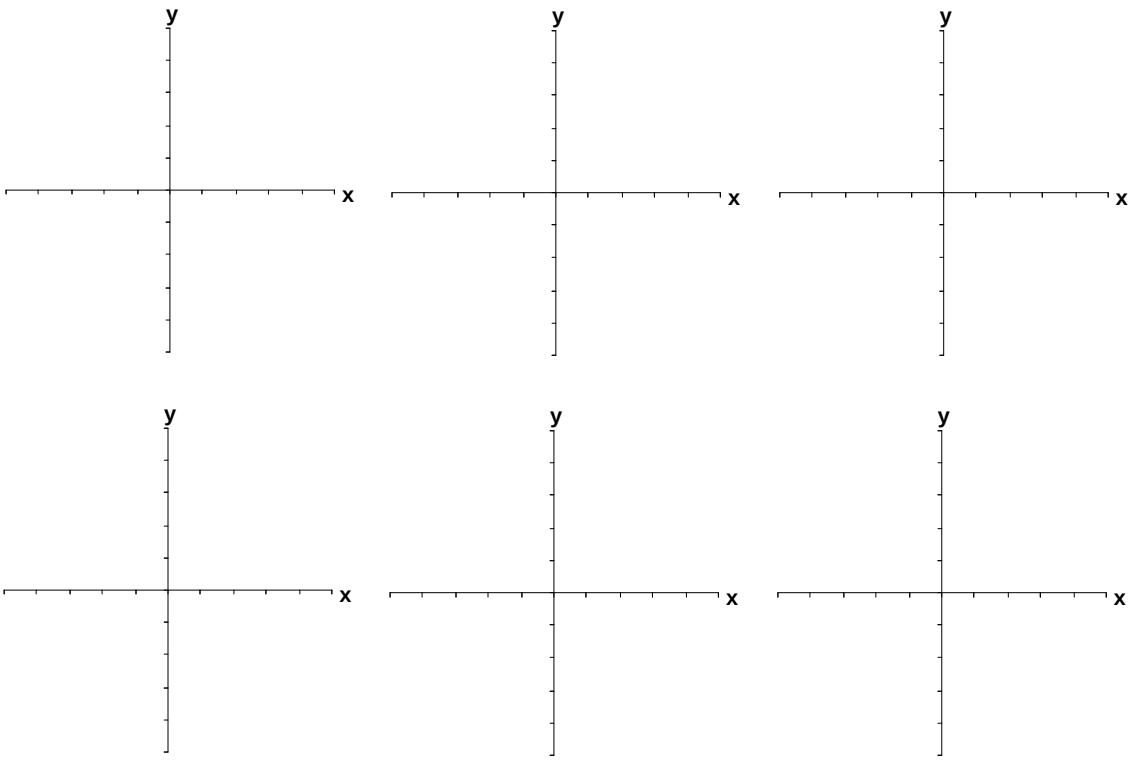
Additional notes



Homework Assignment

Page(s)

Exercises

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