

COLLEGE ALGEBRA

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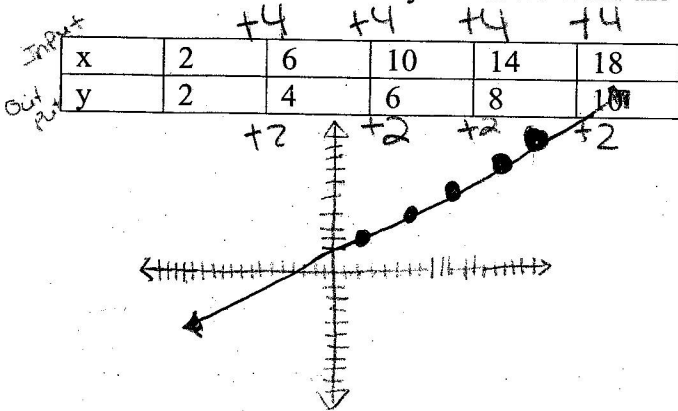
GPS #6 1.6 FITTING LINES TO DATA POINTS: MODELING LINEAR FUNCTIONS

Class Time: Tu 11:30 Date: 1-17-08

Useful Definitions:

- * **Linear Model:** A linear model is an equation of the form $f(x) = a + bx$
- * **Linear Regression** (the least-square method): A procedure which defines the best-fit line as the line for which the sum of the squares of vertical distances from the data points to the line is a minimum.
- * **Constant first differences:** If the first differences of data outputs are constant (for equally spaced inputs), a linear model can be found that fits the data exactly. If the first differences are "nearly constant," a linear model can be found by an approximate fit for the data.
- * **Discrete:** It is used to describe the data or a function that is presented in the form of a table or in a scatterplot.
- * **Continuous:** It is used to describe a function or graph when the inputs can be any real number.

1. Construct a scatter plot of the data in the table. Can the scatter plot be fit exactly or only approximately by a linear function? How do you know? Find the linear function that is the best fit for the data.



• fit exactly because they are equal spaced.

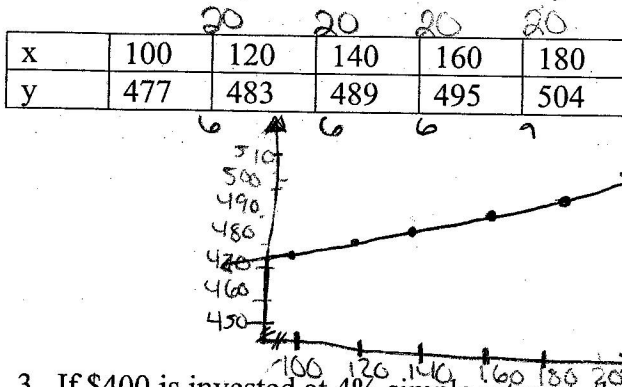
• Thus, a linear model can be found

$$f(x) = a + bx$$

$$f(x) = 1 + \frac{1}{2}x$$

2. a) Find the least-squares regression line in the form $f(x) = a + bx$.

b) Use the regression line to estimate y when $x = 150$ (interpolation) and $x = 200$ (extrapolation).



A) $A = 443.4$ Approximate fit
 $B = .33$

$$f(x) = 443.4 + .33x$$

B) $f(150) = 443.40 + .33(150)$
 492.9

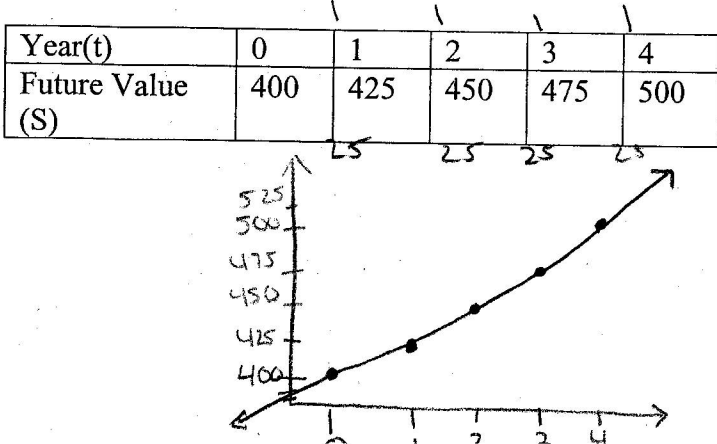
$f(200) = 443.40 + .33(200) = 509.4$

3. If \$400 is invested at 4% simple interest, the future value S in t years is given in the table below.

a) Is the rate of change of the future value constant for uniform inputs?

b) Can the future value be modeled by a linear function?

c) Write the equation that gives the future value as a function of the time in years in slope-intercept form.



A. 25 dollars per year

B. yes, because they are equal spaced and constant

C. $y = 400 + 25x$

$$S(t) = 400 + 25t$$