Linear Functions

A function is **linear** if any change in the input causes a proportional change in the output.

Therefore y is a linear function of x means that: *any change in y is proportional to the corresponding change in x.*

This is often written as:

$$\Delta y \; \propto \; \Delta x$$
$$\Delta y \; = \; m\Delta x,$$

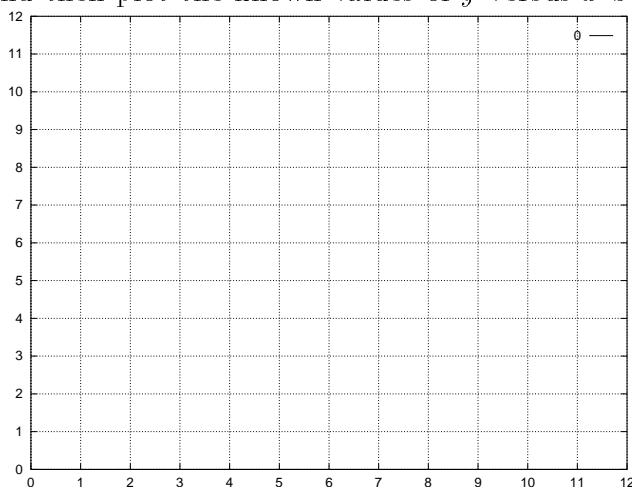where m is the constant of proportionality.

Examples:

[1]. Suppose that y is a linear function of x. If $y = 2$ when $x = 0$ and $y = 5$ when $x = 2$, what is the constant of proportionality?

[2]. What is y when $x = 3$?

Exercise

Compute y when $x = 6$ and then plot the known values of y versus x below:

Formulas of Straight Lines:

The common formulas for a line can be derived from the equation of proportionality $\Delta y = m\Delta x$. Assume that (x_0, y_0) is a fixed point on the line, (x, y) is an arbitrary point, and m is the constant of proportionality. Then,

point-slope form

initial value form

slope-intercept form

The constant m has many different interpretations. It is called the *slope* or *constant of proportionality* or *rate of change of y with respect to x*.

<u>GROUPWORK</u>

In groups of three, write down each of the forms of the line which goes through the point (-1,2) with slope -3. Each one of the team members should choose one form of the line and derive that form.

Confer with the members of your group and show that each one of you has an *equivalent* form of the line. (That is, by re-arranging your answers the equations will be identical.)

ANNOUNCEMENTS

READ Pages 25-30 of *Calculus in Context* (hereafter known as CiC)

DO Problems 1, 7, 11 and 13 on page 11 (Section 1.2) of Hughes-Hallett

1. Two Gateway Exams (Exponents and Equations) will be given in lab on Thursday, along with a Technology Survey