Section 1.1: Slopes and Equations of Lines

SLOPE OF A LINE: The slope of a line is defined as the vertical change (the "rise") over the horizontal change (the "run") as one travels along the line. In symbols, taking two different points (x_1, y_1) and (x_2, y_2) on the line, the slope is

$$m = \frac{\text{Change in } y}{\text{Change in } x} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}.$$

Examples

1. Find the slope of the line through the points $(4, 5)$ and $(-1, 2)$.

2. Find the slope of the line $y = 3x - 2$.

Review

i What is an x-intercept?

ii What is a y-intercept?

iii What is the *slope-intercept* form for a line with a slope of m and a y-intercept of b?

iv What is the *point-slope* form for a line with slope m and passing through the point (x_1, y_1)?

v What is the equation for a vertical line?

vi What is the equation for a horizontal line?

Examples

3. (a) Find the equation of the line that goes through the point $(4, 5)$ and has a slope of -3.

   (b) Graph the line.

4. World soybean production was 136.5 million tons in 1980 and 214 million tons in 2005, and has been increasing at an approximately constant rate.

   (a) Determine a linear equation that approximates world soybean production, P, in millions of tons, in terms of t, the number of years since 1980.

   (b) Using units, interpret the slope in terms of soybean production.

(c) Using units, interpret the vertical intercept in terms of soybean production.

(d) According to the linear model, what is the predicted world soybean production in 2015?

(e) According to the linear model, when is soybean production predicted to reach 250 million tons?