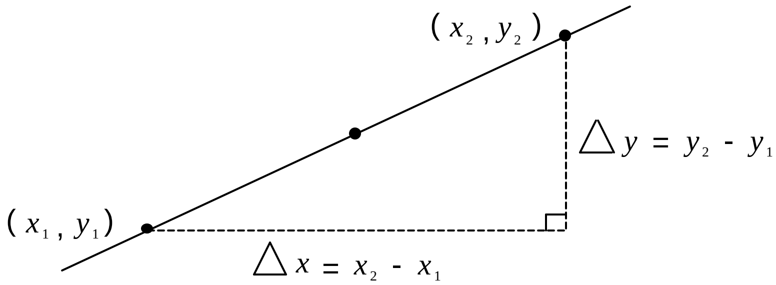
LINEAR FUNCTIONS

- *Linear functions* have straight line graphs.

  A straight line graph with equation $x = a$ does not represent a linear function. Why?

- Important ideas and results relating to straight line graphs:



gradient of line joining (x_1, y_1) and (x_2, y_2)	$m = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$
increasing function	$m > 0$
decreasing function	$m < 0$
gradient of line making *angle q* with the positive direction of the x-axis	$m = \tan q$
to find the x-*intercept* given an equation	substitute $y = 0$
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equation of *vertical* line with x-intercept a	$x = a$
equation of *horizontal* line with y-intercept b	$y = b$
gradient-intercept form of linear equation: equation of line of gradient m and y-intercept c	$y = mx + c$
standard form of linear equation	$ax + by + c = 0$ (a, b, c integers)
gradient-point form of linear equation: equation of line of gradient m passing through (x_1, y_1)	$\frac{y - y_1}{x - x_1} = m$ or $y - y_1 = m(x - x_1)$
two-point form of linear equation: equation of line passing through (x_1, y_1) and (x_2, y_2)	$\frac{y - y_1}{x - x_1} = \frac{y_2 - y_1}{x_2 - x_1}$
two-intercept form of linear equation: equation of line with x-intercept a and y-intercept b	$\frac{x}{a} + \frac{y}{b} = 1$
parallel lines have the same gradient	$m_1 = m_2$
perpendicular lines: product of gradients is -1	$m_1 m_2 = -1$ or $m_2 = -\frac{1}{m_1}$
collinear points are in a straight line	if $m_{AB} = m_{AC}$ then A, B, C are collinear
distance formula (Pythagoras' Theorem): length of line joining (x_1, y_1) and (x_2, y_2)	$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
midpoint of line joining (x_1, y_1) and (x_2, y_2)	$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$