Linear Relations

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What is a linear relation?

I think of a linear relation as an equation with two variables that can be rearranged into the equation of a line. For example, if we are given the following relation,

$$4x - 3y = 4$$

we can solve for y. What does it mean to solve for y? When I hear solve for y, I think of this as bringing the y onto one side of the " = " sign and everything else to the other side of the " = " sign and then seeing what y equals. Let's do this together for the relation above.

$$\begin{aligned} 4x - 3y &= 4 \\ -3y &= 4 - 4x \\ y &= -\frac{4}{3} - \frac{4}{-3}x \\ &= -\frac{4}{3} + \frac{4}{3}x \\ y &= \frac{4}{3}x - \frac{4}{3} \end{aligned}$$

which has the form of the *equation of a line*.

Exercises

1. Determine which relations are linear relations.

   a) $6x - 2y - 4$

   b) $-x^2 - 2y = 3x + 2$

   c) $3x = \frac{1}{y} + 2$

   d) $2y - x + 1 = 3y + 2x$

   e) $x + 3x^3 + x^2 = y$

