$$x^3 - x + 6 = 0$$

What is this?

equation

What does a solution mean?

value that makes the equation true

$(-2)^3 - (-2) + 6 = 0$

$-8 + 2 + 6 = 0$

$0 = 0$ ✓

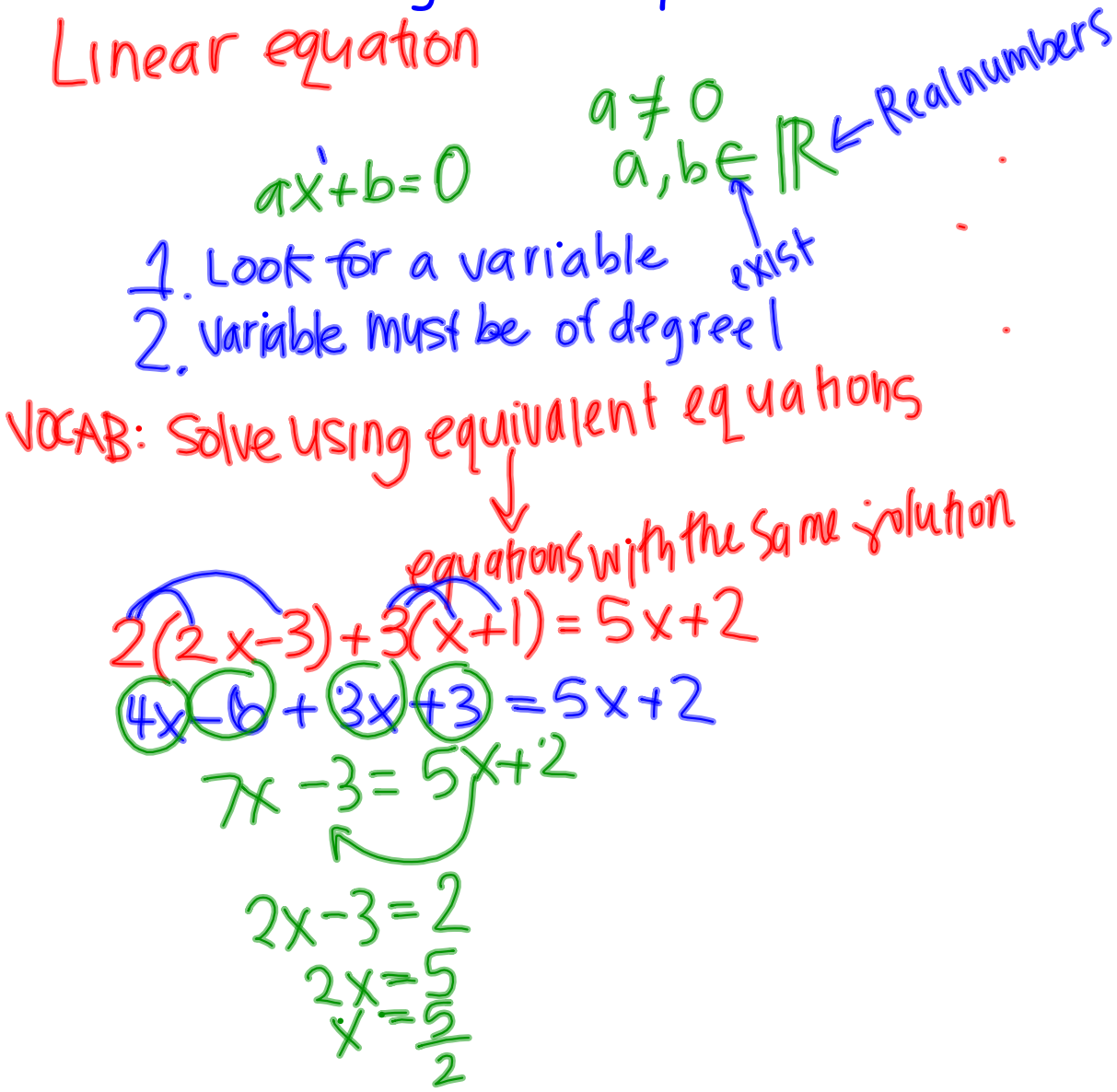
What is x?

Variable

What do we do?

Solve For x

Most basic Algebraic equation?



How do we decide if an equation is linear?

VOCAB: Two equations are equivalent if...

Linear Inequalities

$< \quad > \quad \leq \quad \geq$

$ax+b \geq 0 \quad a \neq 0 \quad a, b \in \mathbb{R}$

$\geq$

$\leq$

$3 < 7$

$x < y$ less than

$x > y$ greater than

Solving for a solution set

$(-1)\,4 < 5\,(-1)$

$-4 > -5$

If $u < v$ and $c > 0$, $cu < cv$

If $u < v$ and $c < 0$, $cu > cv$

ex. $3(x-1)+2 \leq 5x+6$

$3x-3+2 \leq 5x+6$

$3x-1 \leq 5x+6$

$-1 \leq 2x+6$

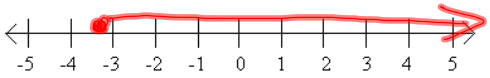
$-7 \leq 2x$

$\frac{-7}{2} \leq \frac{2x}{2}$

$-7/2 \leq x$

$x \geq -7/2$

$[-7/2, \infty)$



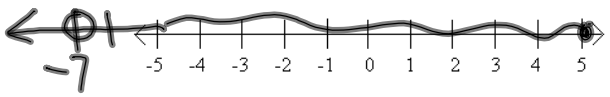
ex. $-3 < \frac{2x+5}{3} \leq 5$

$-1 < 2x+5 \leq 15$

$\frac{-14}{2} < \frac{2x}{2} \leq \frac{10}{2}$

$-7 < x \leq 5$

$(-7, 5]$

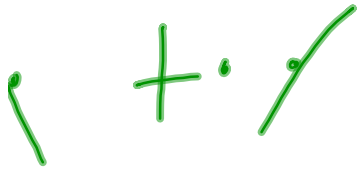


General Form: $Ax + By + C = 0 \quad A, B \neq 0$
Slope Intercept: $y = mx + b$
Point-Slope: $y - y_1 = m(x - x_1)$
Vertical Line: $x = a$
Horizontal Line: $y = b$

Parallel and Perpendicular
1. Two nonvertical lines are parallel iff their slopes are equal.

2. Two nonvertical lines are perpendicular iff their slopes are opposite reciprocals. Iff

$$m_1 = -\frac{1}{m_2}$$



$y = 2x$

$y = -\frac{1}{2}x$

1. Two lines are $\parallel$ iff slopes are equal
2. Two lines are $\perp$ iff slopes are opposite reciprocals.

$m_1 = -\frac{1}{m_1}$

$P(2,-3)$ $4x+y=3$

1. Find slope of $4x+y=3$

$y = -4x+3$ $-\frac{1}{2}$ -3

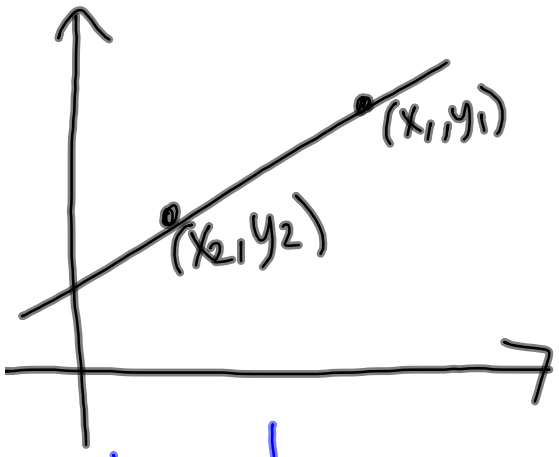
slope $= -4$

$\perp$ slope $= \frac{1}{4}$

$y-(-3) = (\frac{1}{4})(x-2)$

$y+3 = \frac{1}{4}x - \frac{1}{2}$

$y = \frac{1}{4}x - \frac{7}{2}$



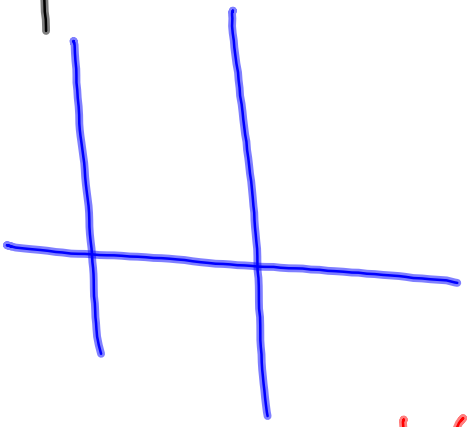
Line

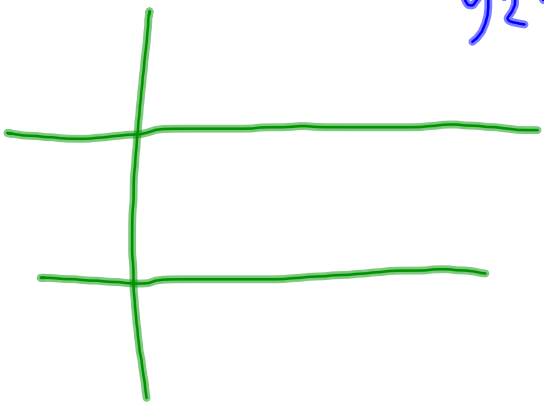
$\frac{\text{rise}}{\text{run}}$, steepness, $\frac{\Delta y}{\Delta x}$

$\frac{y_2 - y_1}{x_2 - x_1}$

$x_2 = x_1$ slope undefined

$y_2 = y_1$ slope 0



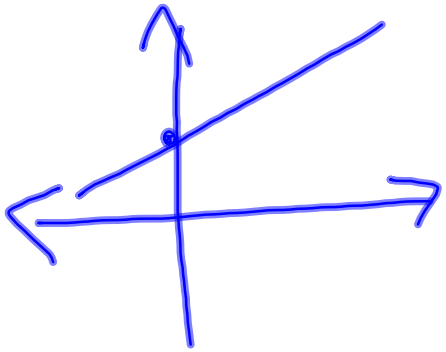


$(-1, 2)$ & $(4, 2)$ $\frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2-2}{4-(-1)} = \boxed{\frac{-4}{5}}$

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$(x_2 - x_1)m = y_2 - y_1$ point slope FORM

$m(x_2 - x_1) = y_2 - y_1$



y intercept - $(0, b)$

$m(x - 0) = y - b$

$mx = y - b$

$mx + b = y$ slope intercept FORM