$x^{3}-x+6=0$
What does a solution mean?
value that makes
the equation true

$$
\begin{gathered}
(-2)^{3}-(-2)+6=0 \\
-8+2+6=0 \\
0=0
\end{gathered}
$$

What is this? equation

What is $x$ ?
Variable
What do we do? solve for $x$

Most basic Algebraic equation?

$$
a x^{\prime}+b=0 \quad a \neq 0
$$

1. Look for a variable
2. Variable must be of degree

VOCAB: Solve USing equivalent eq cations
equations with the same jolution

$$
2(2 x-3)+3(x+1)=5 x+2
$$

$$
(4 x-6)+(3 x)+3)=5 x+2
$$

$$
7 x-3=5 x+2
$$

$$
\begin{array}{r}
2 x-3=2 \\
2 x=5 \\
x=\frac{5}{2}
\end{array}
$$

How do we decide if an equation is linear?

VOCAB: Two equations are equivalent if...

Linear Inequalities

$$
\begin{aligned}
& <>\leqslant \geq \\
& a x+b=0 \quad a \neq 0 \quad a, b \in \mathbb{R}^{3} \\
& 3<7
\end{aligned}
$$

Solving for a solution set

$$
\begin{gathered}
(-1) 4<5(-1) \\
-4>-5 \\
\text { If } u<v \text { and } c>0, c u<c v \\
\text { If } u<v \text { and } c<0, c u>c v \\
\text { ex. } 3(x-1)+2 \leq 5 x+6 \\
3 x-3+2 \leq 5 x+6 \\
3 x-1 \leq 5 x+6 \\
-1 \leq 2 x+6 \\
-7 \leq 2 x \\
\frac{7}{2} \\
-7 / 2 \leq x \\
x \geq-7 / 2 \\
{[-7 / 2, \infty)} \\
\text { ex. } \quad-3<\frac{2 x+5}{3} \leq 5 \\
-9<2 x+5 \leq 15 \\
\frac{-14}{2}<\frac{2 x}{2} \leq \frac{10}{2} \\
-7<x \leq 5 \\
(-7,5]
\end{gathered}
$$

# General Form: $A x+B y+C=0 \quad A, B \neq 0$ Slope Intercept: $y=m x+b$ <br> Point-Slope: $y-y_{1}=m\left(x-x_{1}\right)$ <br> 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

$$
m_{1}=-\frac{1}{m_{2}}
$$

$$
\begin{array}{cl}
t \cdot \% & y=2 x \\
y=-\frac{1}{2} x \\
P(2,-3) & 4 x+y-3 \\
1 & 1 .
\end{array}
$$

1. Find slope of $4 x+y=3$ $\begin{array}{ll}y=-4 x+3 & -1 \\ \text { Sope } & =-4\end{array}$ 1 sope $=-4$

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

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

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

1. Twolinesare II iff

Slopes are equal
2. Twolinesare I Iff Slopes are opposite reaprocals.

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



Line
$\frac{114}{\text { run }}$, steepness, $\frac{\Delta y}{\Delta x}$

$$
\begin{array}{ll}
\frac{y_{2}-y_{1}}{x_{2}-x_{1}} & \begin{array}{l}
x_{2}=x_{1} \text { Slope } \\
y_{2}=y_{1} \text { ndedimed } \\
y_{2} \\
\end{array}
\end{array}
$$

$$
(-1,2) \div(4,-2)
$$

$$
m=\frac{y_{2}-y_{1}}{x_{2}-x_{1}}
$$

$\left(x_{2}-x_{1}\right)^{2}=y_{2}-y_{1}$ points loper Form $m\left(x_{2}-x_{1}\right)=y_{2}-y_{1}$ y intercept $-(0, b)$


$$
\begin{gathered}
m(x-0)=y-b \\
m x=y-b \\
m x-b=y \quad \begin{array}{c}
\text { Slope intercept } \\
\text { FORM }
\end{array}
\end{gathered}
$$

