3.2 - Graphs of Equations

↳ A graph of an equation is a plot of all the points that satisfy the equation.
↳ (coordinates)

Ex Plot the graph of $2x - y = 1$

↳ start out by solving for y

$2x - y = 1 \quad \rightarrow -2x$

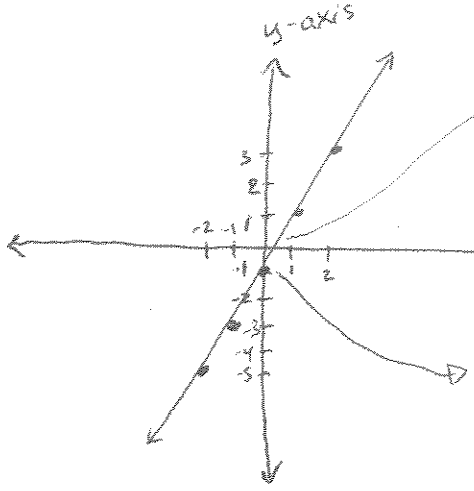
$-y = -2x + 1 \quad \rightarrow \cdot(-1)$

$y = 2x - 1$

↳ plot points. Choose x-value and find corresponding y-value.

↳ connect the points.

x	$y = 2x - 1$
-2	-5
-1	-3
0	-1
1	1
2	3



x-intercept:
- where graph crosses x-axis
- solve for x when y = 0

$0 = 2x - 1 \Rightarrow 1 = 2x$

$\Rightarrow \frac{1}{2} = x$

or $(\frac{1}{2}, 0)$ coordinates

y-intercept:
- where graph crosses y-axis
- Solve for y when x = 0

$y = 2(0) - 1$

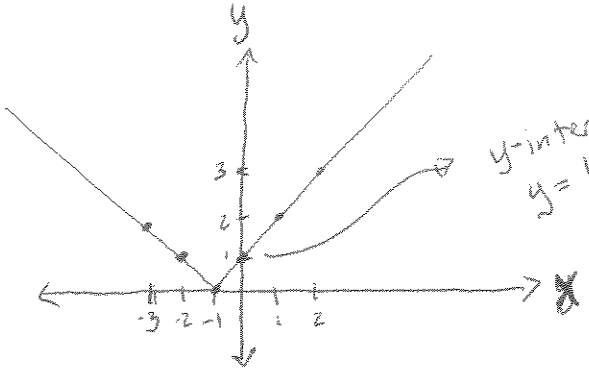
$\Rightarrow y = -1$ or $(0, -1)$ coordinates

Note: $y = 2x - 1$ is a linear equation. (power on x is 1 and on y is 1)

the graph is a straight line

Ex Sketch a graph of $y = |x+1|$

x	$y = \|x+1\|$
-2	1
-1	0
0	1
1	2
2	3



y-intercept:
$y = |0+1| = 1$
$(0,1)$ ← coordinates

x-intercept:

$0 = |x+1|$

$\Rightarrow 0 = x+1$

$\Rightarrow -1 = x$

coordinates: $(-1,0)$

→ $y = |x+1|$ is <u>not</u> a linear function. You can't connect all the points with 1 straight line.

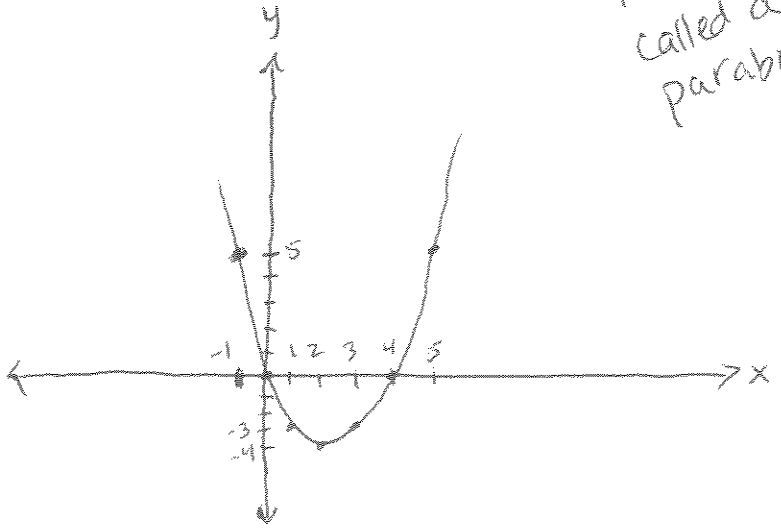
Ex Sketch $-x^2 + 4x + y = 0$

Solve for y: $-x^2 + 4x = -y$

$\Rightarrow x^2 - 4x = y$

$\Rightarrow y = x^2 - 4x$

x	$y = x^2 - 4x$
-2	$(-2)^2 - 4(-2) = 4+8 = 12$
-1	$(-1)^2 - 4(-1) = 1+4 = 5$
0	0
1	$1^2 - 4(1) = -3$
2	$2^2 - 4(2) = 4-8 = -4$
3	$3^2 - 4(3) = 9-12 = -3$
4	$4^2 - 4(4) = 16-16 = 0$
5	$5^2 - 4(5) = 25-20 = 5$



This is called a parabola

Ex cont...

x-intercepts: 2 of them

$0 = x^2 - 4x$

$\Rightarrow 0 = x(x-4)$

$\Rightarrow x = 0$ and $x = 4$ are both intercepts

$(0,0)$ $(4,0)$

y-intercept:

$y = 0^2 - 4(0) = 0$

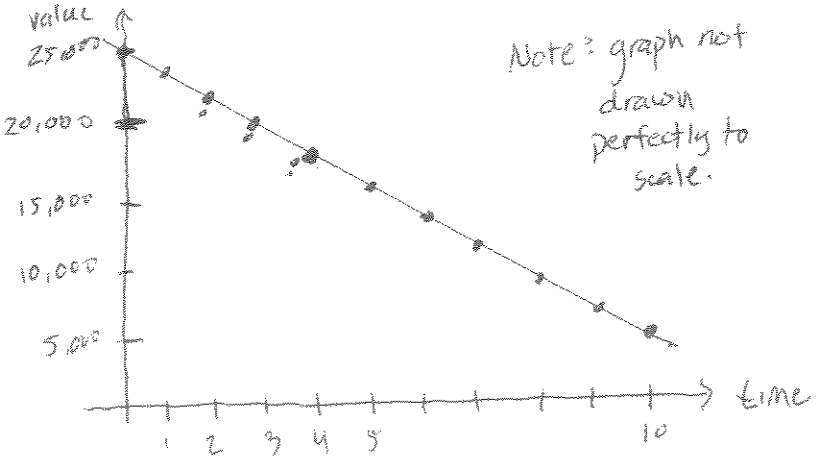
$(0,0)$

Ex Straight line depreciation:

You buy a new car for \$25,000. Your car is worth \$5,000 after 10 years. The value depreciates by the same amount each year. How much does the value depreciate each year? Sketch a graph showing how the value changes over time.

\$25,000 − \$5,000 = \$20,000 → amount value depreciates by in 10 years

$\frac{\$20{,}000}{10 \text{ yrs}} = \$2{,}000$ → amount value depreciates each year



Note: graph not drawn perfectly to scale.

You can express this as the equation

Value $= -2{,}000t + 25{,}000$

where t = years

Value is zero in

$0 = -2{,}000t + 25{,}000$

$\Rightarrow 2000t = 25{,}000 \Rightarrow t = \frac{25{,}000}{2{,}000} = 12.5$ years