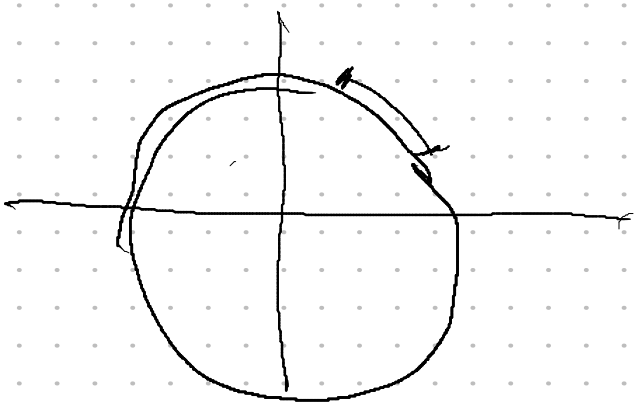
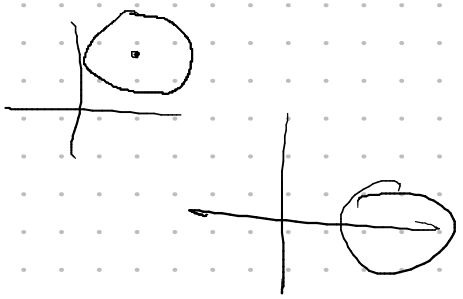


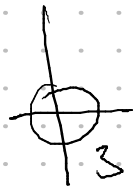
"Unit Circle"

1 unit of radius.



2 things

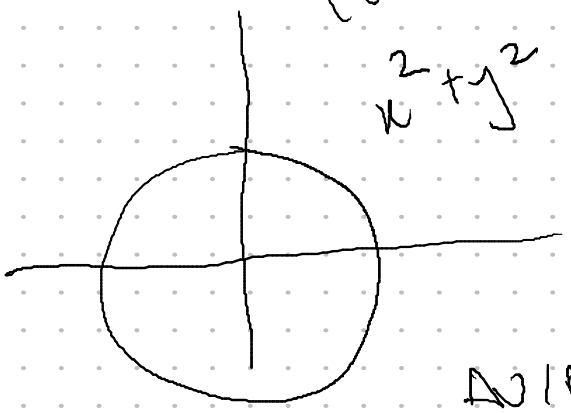
Circles



(unit circle)

$x^2 + y^2 = 1$

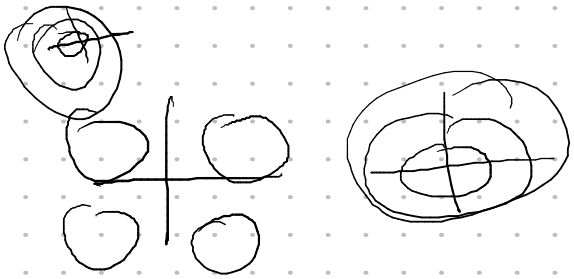
Y-10

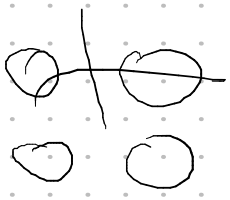


NJ Britch

2 things that characterise a circle:

1. radius
2. centre



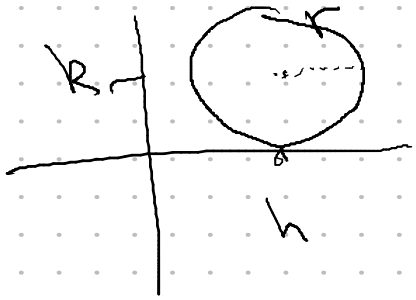


Encode this mathematically:

Question: $x^2 + y^2 = 1$

General Form:

$$(x-h)^2 + (y-k)^2 = r^2$$



radius = 1

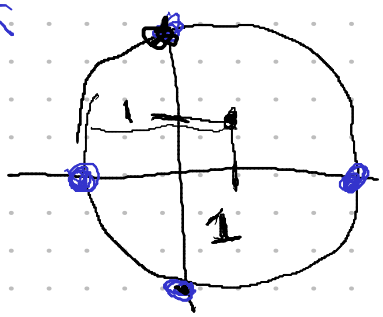
centre = $(h,k) = (0,0)$

$(x-0)$

(3b) Centre $(1,1)$; radius = 4

y-int

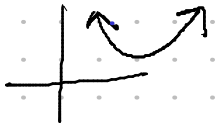
x-int.



$$(x-1)^2 + (y-1)^2 = 16$$

$$(x-h)^2 + (x-k)^2 = r^2$$

General Form = Normal Form



$$(x-1)^2 + (y-1)^2 = 4^2$$

Y-int: Let $x = 0$:

$$(0-1)^2 + (y-1)^2 = 16$$

$$(-1)^2$$

$$+1 + (y-1)^2 = 16$$

$$+1 \quad y^2 - 2y + 1 = 16$$

$$(y-1)^2 = 16 - 1$$

$$y - 1 = \pm\sqrt{15}$$

$$\therefore y = \pm\sqrt{15} + 1$$

$$(a-b)^2$$

$$= (a-b)(a-b)$$

$$= a^2 - ab - ba + b^2$$

$$= a^2 - 2ab + b^2$$

$$y^2 - 2y - 14 = 0$$

Quadratic — y is to the power of 2.

Linear → power of 1

$$(y-1)^2 - 15 = 0$$

$$(x-2)^2+(y-2)^2=1$$

x-int: Let $y=0$.

$$(x-2)^2+(0-2)^2=1$$

$$(x-2)^2+4=1$$

$$(x-2)^2=-3$$

"what number times itself gives -3"

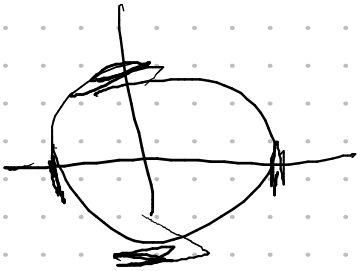
$$x-2=\pm\sqrt{-3}$$

$$-\sqrt{3}\times-\sqrt{3}=3$$

$$\sqrt{-1}=i$$

$$x=\pm\sqrt{3}i+2$$

"no real solutions", $\notin \mathbb{R}$.



$\in \mathbb{C}$

$x = 7$

$(x-1)^2 + (y-1)$

$(x-1)^2 + (0-1)^2 = 16$

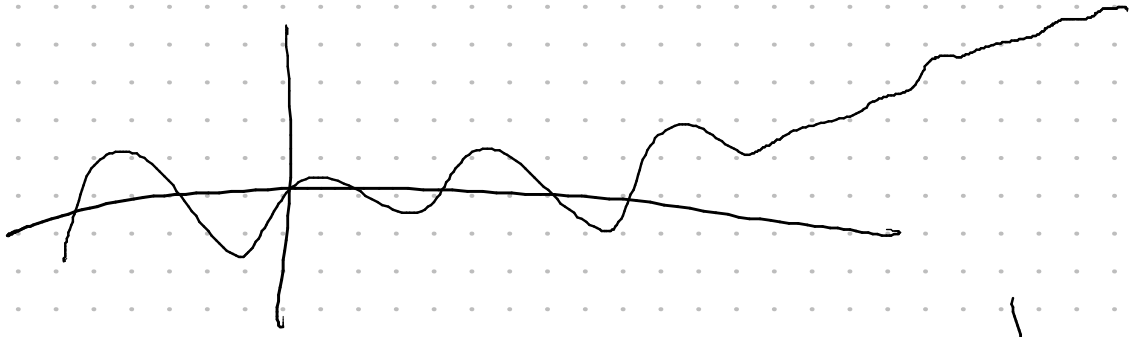
$(x-1)^2 = 15$

$x - 1 = \sqrt{15}$

General Form:

- $ax + by + c = 0$ — Linear (Line)
- $ax^2 + bx + c = y$ — Quadratic (Parabola)

Both of these are polynomials.



$$y = ax^n + bx^{n-1} + \dots + \alpha x^1 + \beta x^0$$

$y = 3x^2 - 2x + 1$ quadratic

$y = 3x - 1$ linear.

→ $y = 5x^4 + 3x^3 + 2x^2 + 1x + 3$

$x^2 + y^2 = 1$

$y^2 = 1 - x^2$

$y = 3x^3 + 0x^2 + 0x^1 + 0x^0$

$y = ax^n + bx^{n-1} + \dots + kx^1 + \beta x^0$

Important: It is not always true that polynomials have non-zero coefficients.

$$y = 3x^3 \quad \checkmark$$

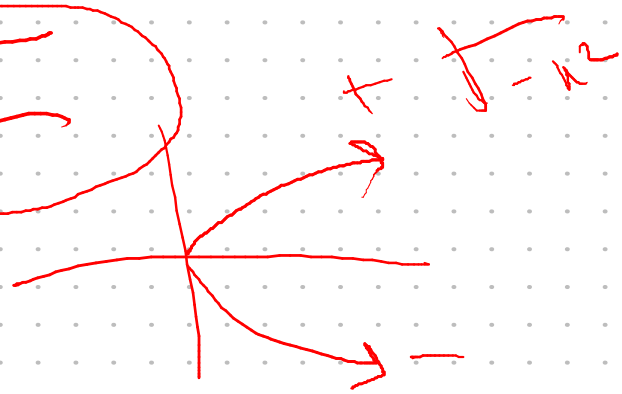
doesn't have to follow the general ladder $y = x^4 + x^3 + x^2 + \dots$ because you are allowed to put 0's as coefficients.

$$x^2 + y^2 = 1 \quad \leftarrow$$

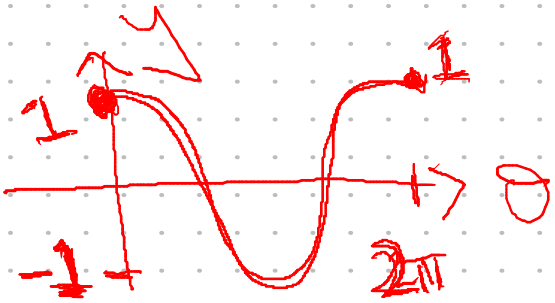
$$y = ax^n + bx^{n-1} + \dots + zx^0 \quad \leftarrow \neq$$

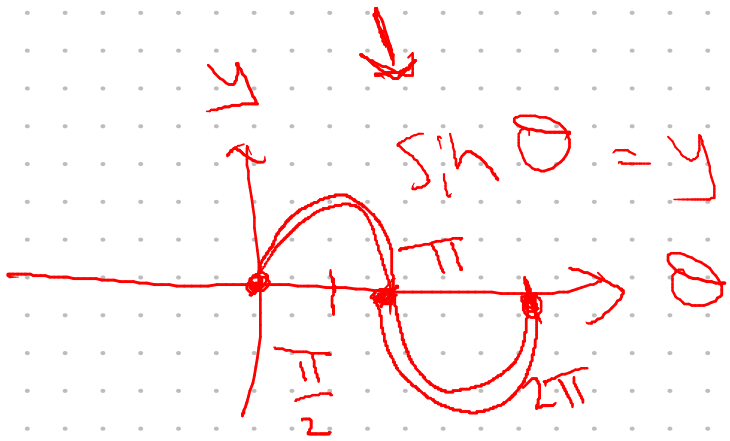
$$y^2 = 1 - x^2$$

$y = \pm\sqrt{1-x^2}$



cosine





5 years ahead math:

$$\sin\theta = \theta - \frac{\theta^3}{3!} + \frac{\theta^5}{5!} - \frac{\theta^7}{7!}$$

$\sin 30°$

"Taylor Expansions"

$$\sin\frac{\pi}{6} = \left(\frac{\pi}{6}\right)^1 - \frac{\left(\frac{\pi}{6}\right)^3}{3!} + \cdots + \cdots$$

$5! = 5\times4\times3\times2\times1$

$3x^2 \times 1$

$$= \frac{3.14}{6} \simeq 0.5$$