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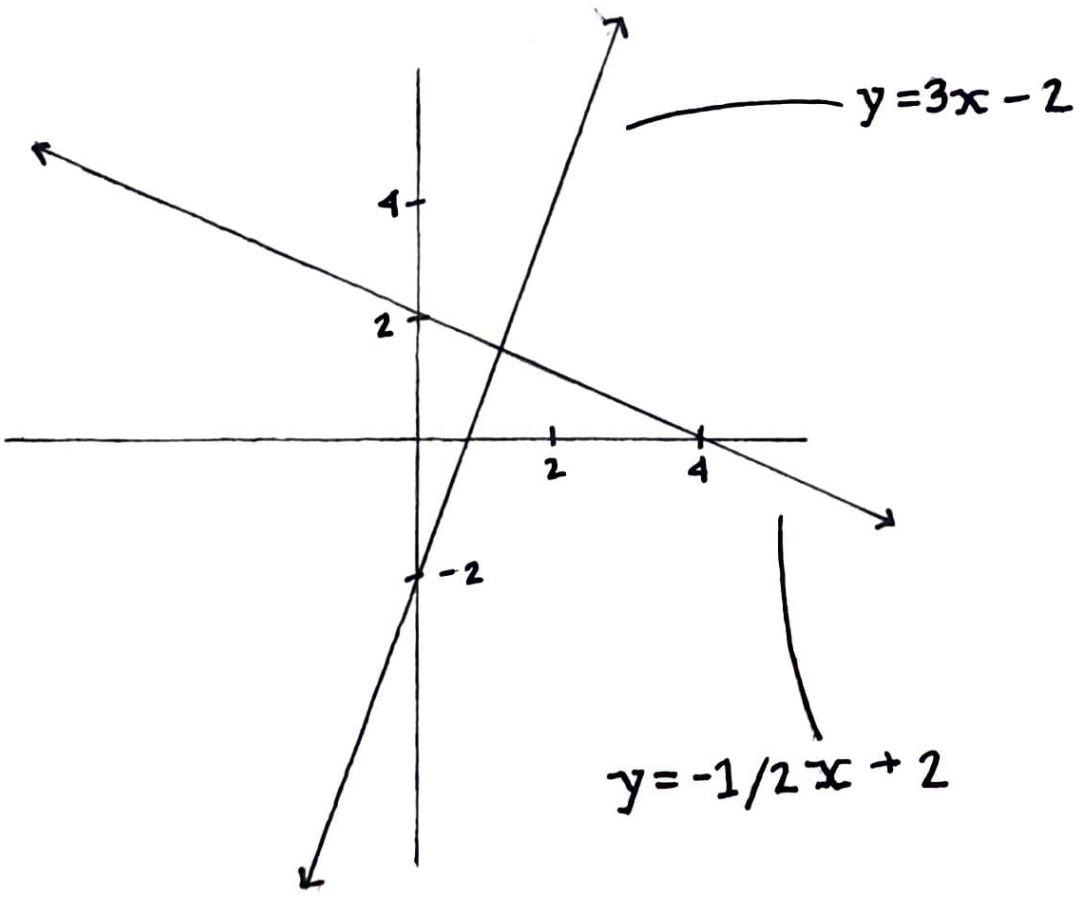
Little Function Limericks

By Sarah Thau

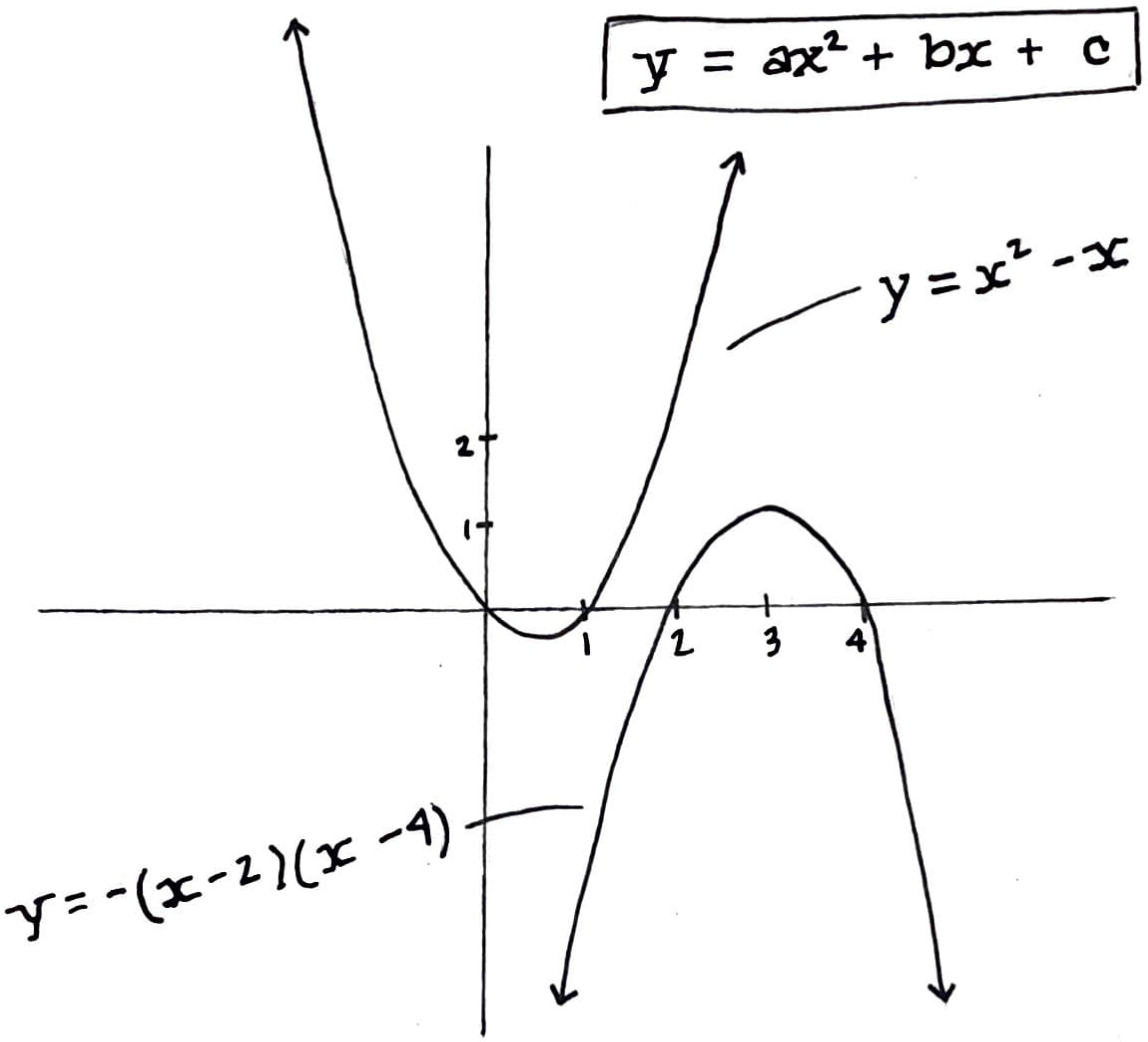
Describing space distance and time
The inputs and outputs in rhyme
They have many a form
And to rules they conform
So let's kick it all off with a line...

Linear

As straight as a board with no curves
A constant for slope it preserves
It will just carry on
All its powers are gone
A slanted shape that has no swerves



$$y = mx + b$$

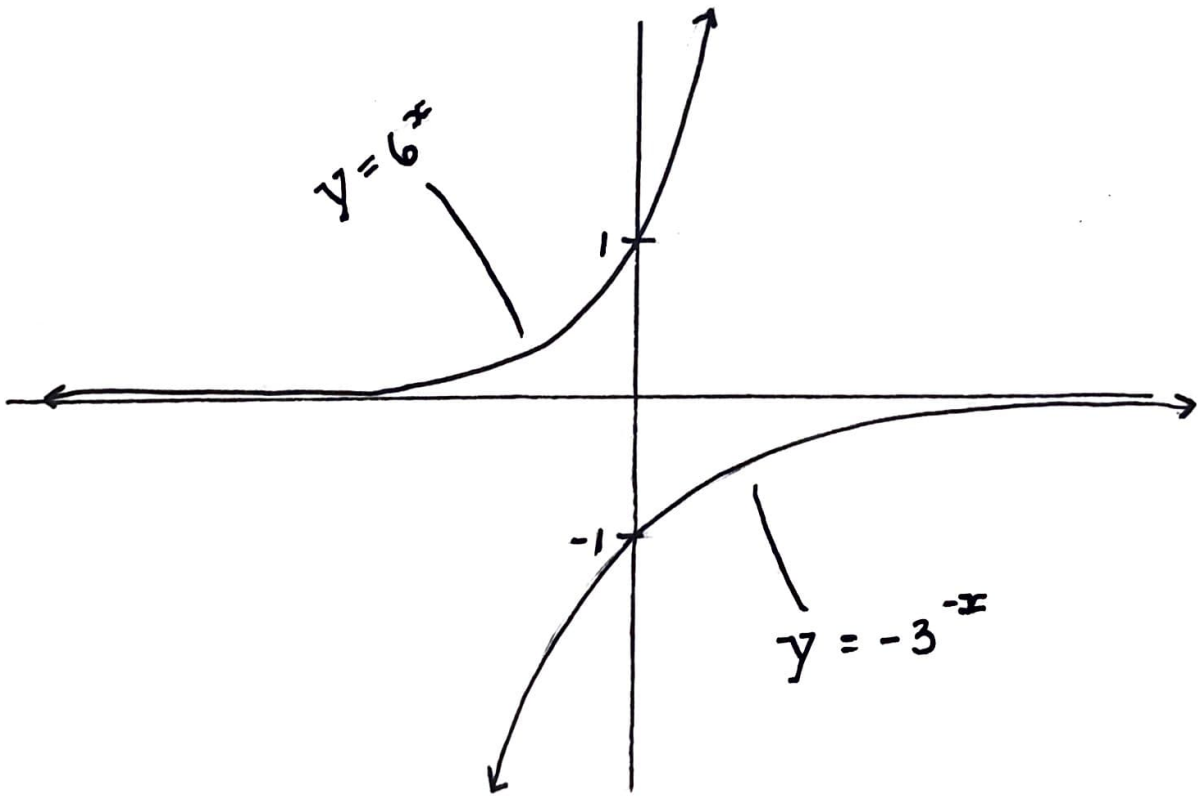


Quadratic

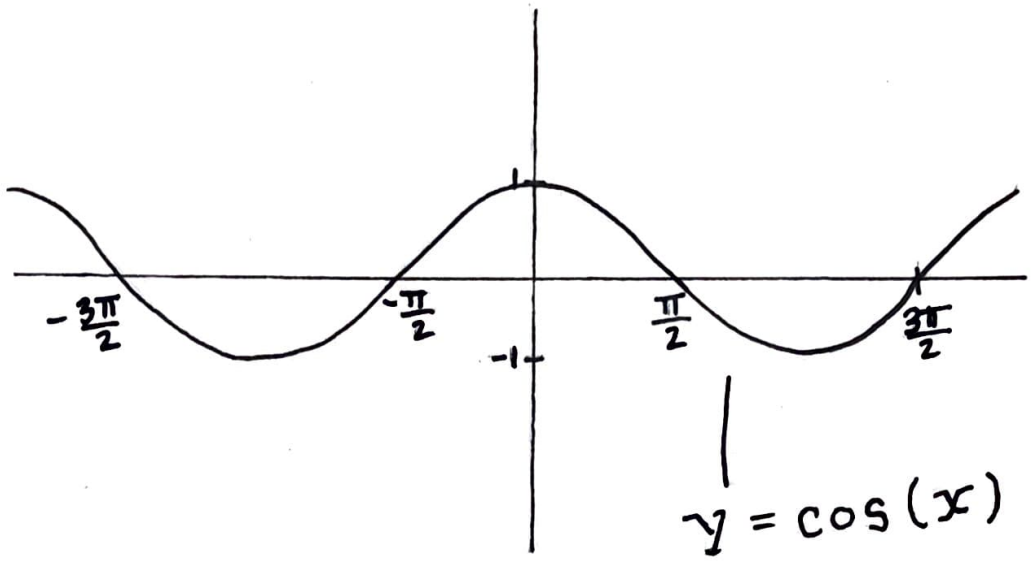
An axis of symmetry and vertex
And it always is concave or convex
An arc it will trace
As it curves out in space
Just one even power not complex

Exponential

To infinity off this one goes
Nears the x-axis but then it slows
A curve brought about
As one end flattens out
Herein growth and decay juxtapose



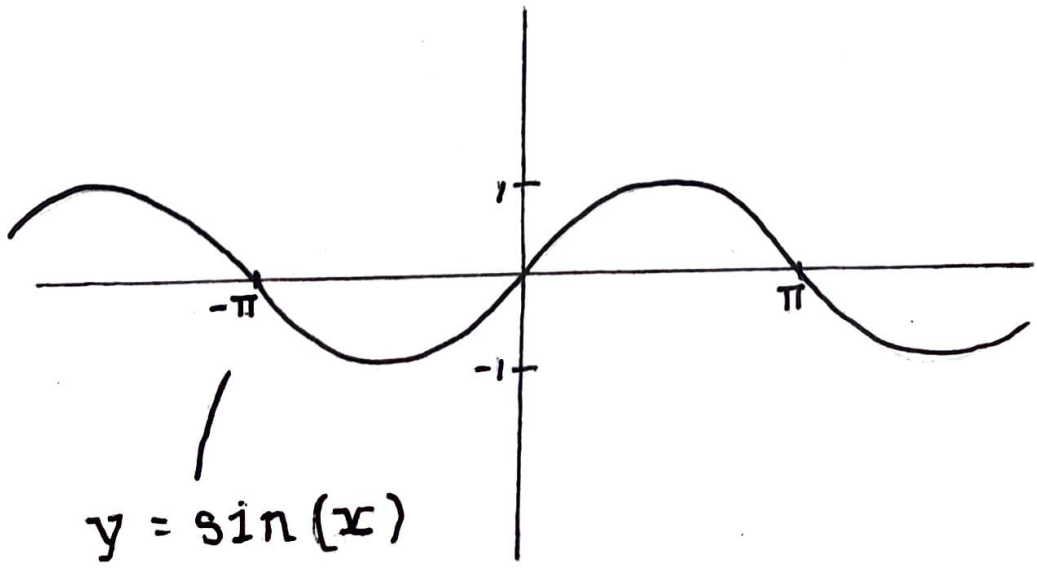
$y = ab^x$



Trigonometric

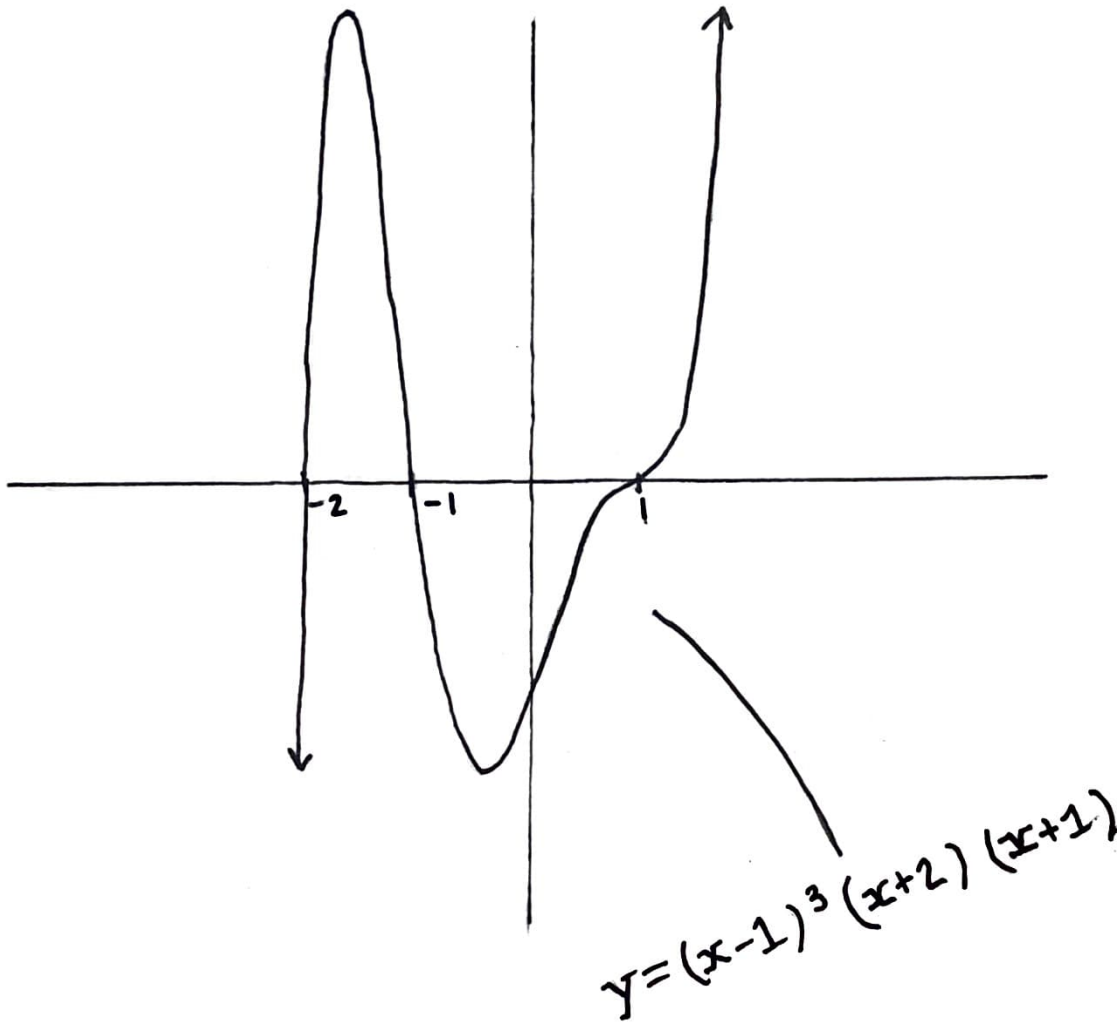
This one is fun! It's a wave!
This is how sine and cosine behave
They repeat without fail
Copying the same trail
Because circular patterns they crave

$$y = a\ trig\ (bx-c) + d$$

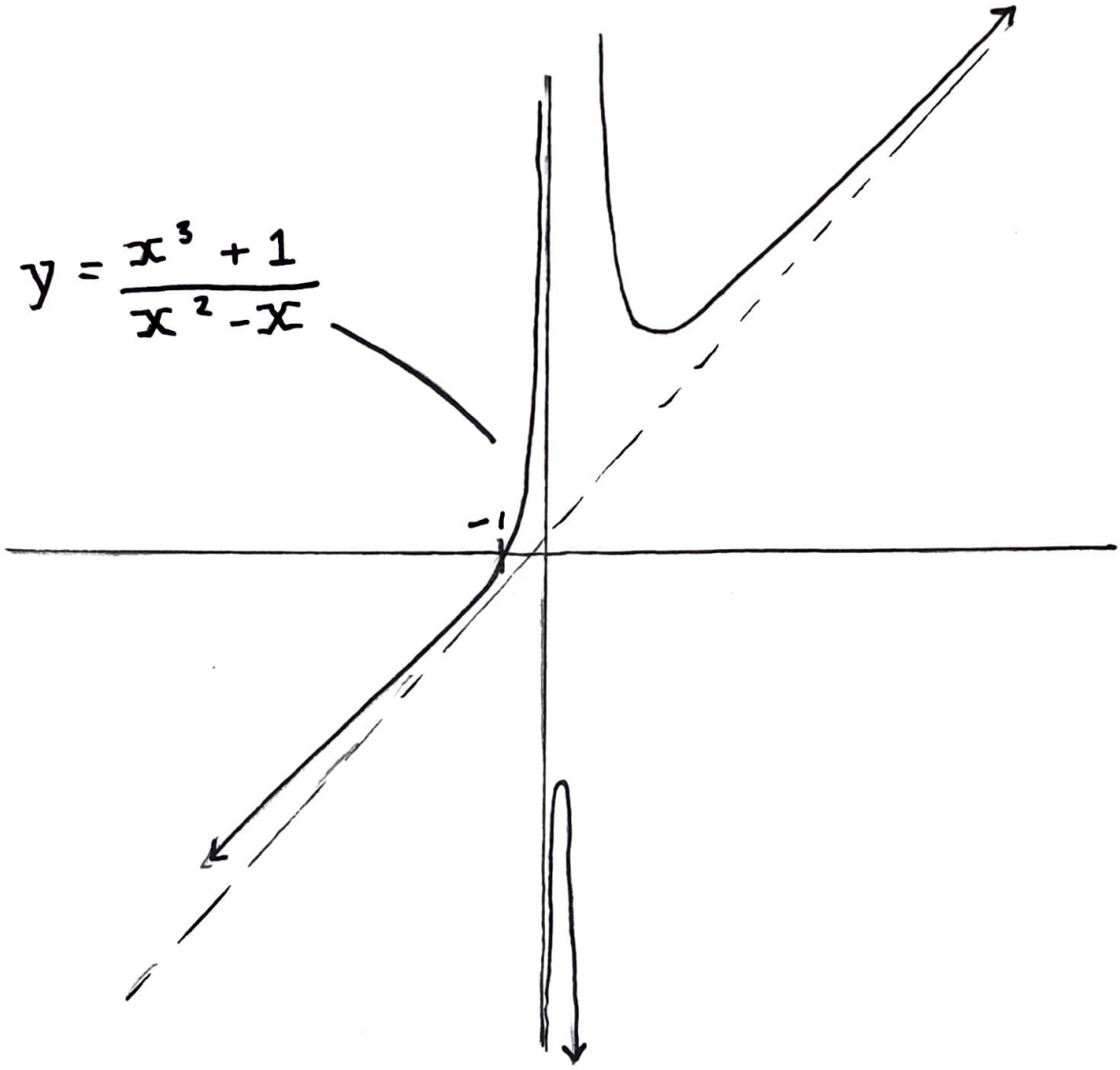


Polynomial

Oh the exponents galore
Sometimes just one term, often more
Largest power you see?
That will be the degree
All its zeros that you will adore



$$y = a_n x^n + a_{n-1} x^{n-1} \ldots + a_2 x^2 + a_1 x + a_0$$



Rational

Polynomials above and below
Holes, slants, and sections, oh no!
Please do not fret,
Do each piece, you're all set!
End behavior should not be a woe

$$y = \frac{a_1 x + b_1}{a_2 x + b_2}$$

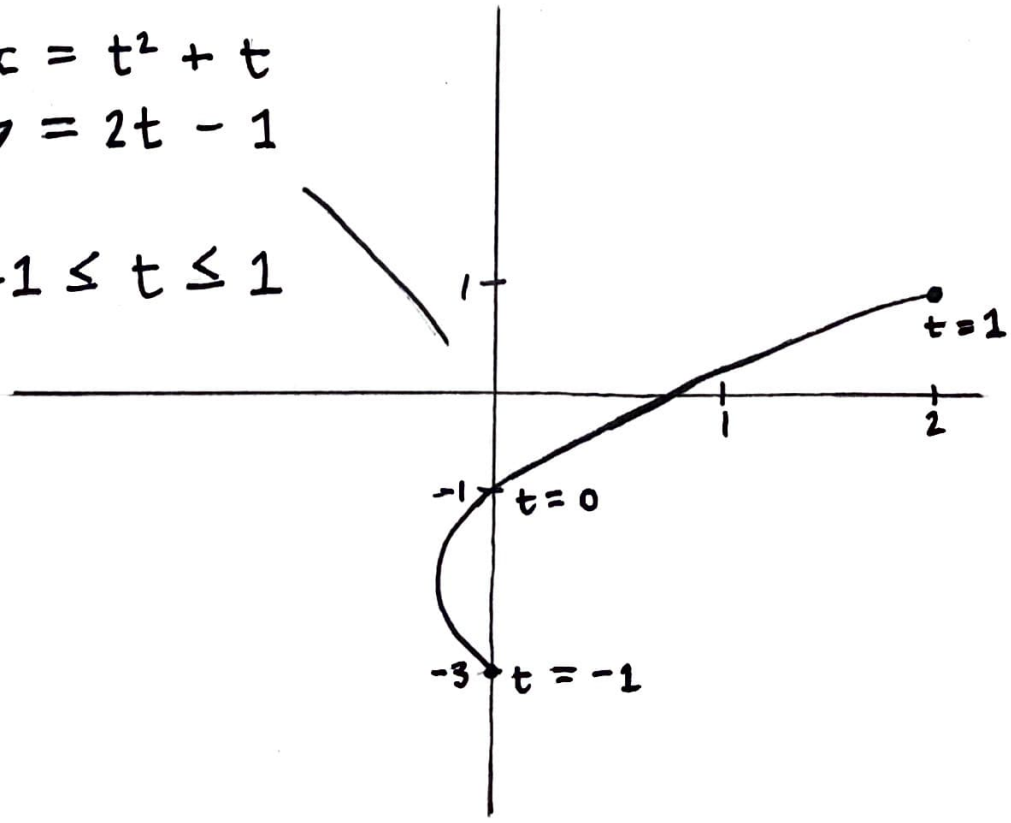
Parametric

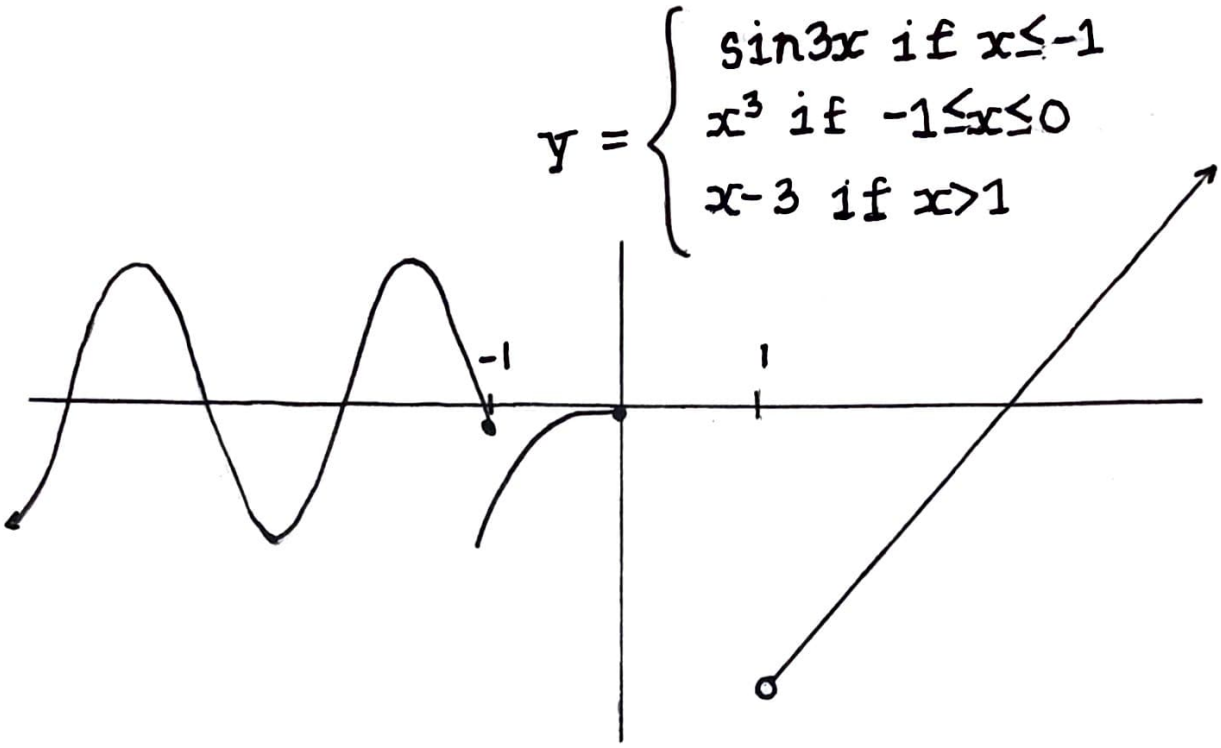
Many equations aligned
By parameters they are defined
Usually non-unique
But with quite the physique
By one metric are functions confined

$$\begin{cases} x = x(t) \\ y = y(t) \end{cases}$$

$$\begin{cases} x = t^2 + t \\ y = 2t - 1 \end{cases}$$

$$-1 \le t \le 1$$



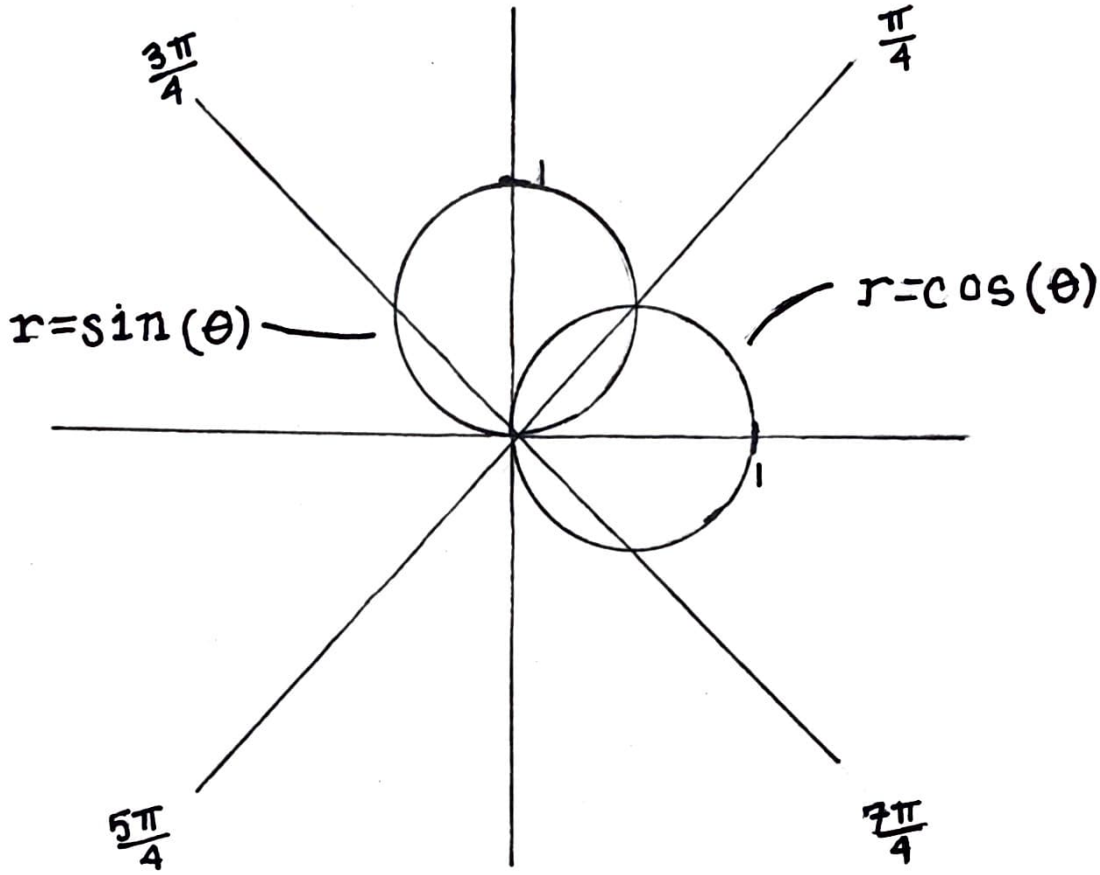


Piecewise

Many functions that start and then end
As the x's go up and descend
It might look abrupt
As the jumps interrupt
Doubtedly a continuous trend

$$y = \begin{cases} \text{formula 1 if } x \text{ is in domain 1} \\ \text{formula 2 if } x \text{ is in domain 2} \\ \text{formula 3 if } x \text{ is in domain 3} \\ \text{etc...} \end{cases}$$

$r = trig(\theta)$



Polar

For this one you'll have to convert
They have non-unique points, be alert
Angle and distance
Allow their existence
From the cartesian plane they divert

Oh what a ride this has been
All sorts of functions you've seen
I'm glad you've had time
For these functions in rhyme
Go get graphing equations pristine!