Definitions

Polynomial Expression: A collection of terms degree is positive integes

monomial : $2x^2$.

binomicals : $3x^2 + 1$.

Trinomials : $4x^3 - 2x - 9$.

Eg. 1. Which of the following is a polynomial expression? Explain

	Yes/No	Reason
$5x^1$	✓	
$2x^{-3} + 3\sqrt{x} - 4$ ($x^{\frac{1}{2}}$)	×	negative & fraction Exponent
$t^2 + 3.5t$	✓	
$3xy^2 + 4x^2$	✓	
$\frac{1}{2}x^5 - 3x^2 - x + 1$	✓	

Polynomial Function:

Type of Polynomial Functions:

Type	Degree	Standard Form $a \neq 0$, a, b, c are $\mathbb{R}$	Example
Constant.	0	$f(x) = ax^0$ $a \neq 0$	$f(x) = 5$ $y = 5$
linear	1	$f(x) = ax + b$ $a \neq 0$	$f(x) = -2x - 1$
quadratic.	2.	$f(x) = ax^2 + bx + c$	
cubic	3	$f(x) = ax^3 + bx^2 + cx + d$	$f(x) = 3x^3 - 2x + 1$
quatic.	4	$f(x) = ax^4 + bx^3 + cx^2 + dx + e$	
n	n	$\boxed{f(x) = a_n x^n + a_{n-1} x^{n-1} + \cdots + a_1 x^1 + a_0}$	

Definitions of Polynomial Functions:

- a_n is the leading coefficient $a_n \neq 0$.
- $a_n, a_{n-1} \cdots\cdots a_1, a_0 \in \mathbb{R}$.
- all exponent are non-negative Integers.
- degree is n.

Ex.2. Complete the following table.

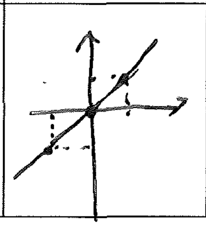
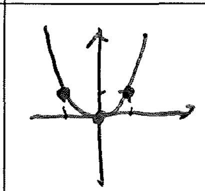
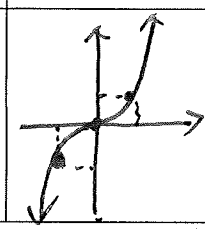
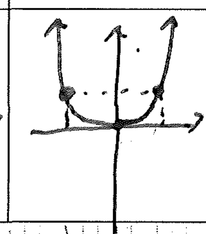
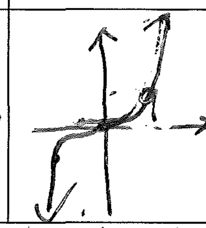
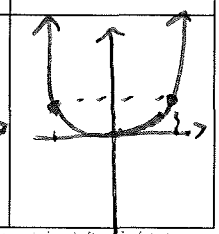
Type	Degree	~~Standard Form~~ type.	~~Example~~ leading coefficient
$f(x)=10x+7$	1	linear	10
$f(x)=3.7x^5-3x^2-x+0.1$	5	quintic. degree 5 poly f.	3.7
$f(x)=2.5$	0	constant	2.5
$f(x)=-\frac{1}{2}x^2+\sqrt{2}x-5$	2	quadratic.	$-\frac{1}{2}$
$f(x)=x(x+1)(x-2)$	3	cubic	1

Eg. 3. Which of the following is a polynomial ~~expression~~ function? Explain

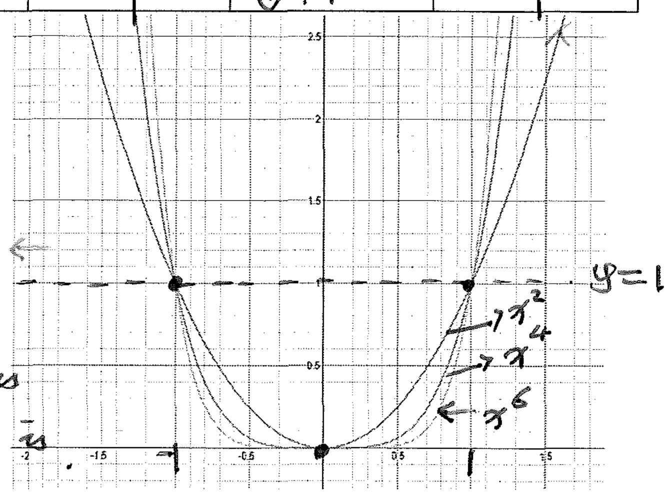
	Yes/No	Reason
~~5x~~ $f(x)=5x$	✓	
$f(x)=2x^{-3}+3x-4$	X	Negative
$f(x)=2^x$	X	degree is a variable
$y=3xz+4x^2$	X	input → x, output → y.
$f(x)=\frac{1}{x\ -1}$ $=(x-1)^{-1}$ $f(x)=\frac{1}{x}$ $=x^{-1}$	X.	reciprocal function.

Power Function: $f(x)=a\,x^n$. $\begin{cases} a>0 \\ a=1 \rightarrow f(x)=x^n. \\ a<0 \end{cases}$

Complete the following chart a= 1

	$y=x$	$y=x^2$	$y=x^3$	$y=x^4$	$y=x^5$	$y=x^6$
Degree	1	2	3	4	5	6
Name	linear	quadratic	cubic	quartic	qintic	sextic.
Basic Shape (Sketch)						

How can you tell the difference between $y=x^2$, $y=x^4$, and $y=x^6$ on a graph?



below y = 1, the higher exponents, the wider the graph is,

above y=1, the higher exponents, the narrower, the graph is
the steeper the slope is

Things to take note of:

The **domain and range** of a function can be stated as an inequality or in interval notation.

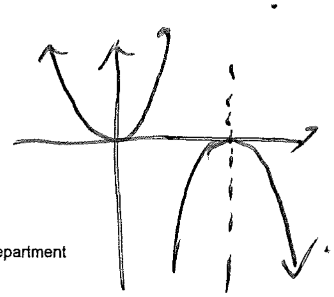
Example:

inclusive → [______ , ______) ← exclude.

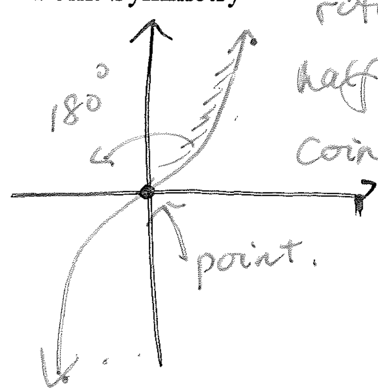
smaller bigger.

When sketching a function it is useful to know if there is **symmetry**. There are two types of symmetry.

Line Symmetry: mirror image along a vertical line.

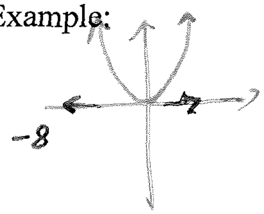


Point Symmetry rotate 180°, half of image coincide the other half.



We will also discuss the **end behaviour** of a function. That is what happens to the y value of the function as the x approaches infinity or negative infinity. The mathematical notation for this is $x \to \infty$ or $x \to -\infty$.

Example:



As $x \to \infty$, $y \to \infty$
As $x \to -\infty$, $y \to \infty$

Complete the following chart

	Odd Power function, $y = x^n$, n is odd	Even Power function, $y = x^n$, n is even
Domain	$x \in R$	$x \in R$
Range	$y \in R$.	$[0, \infty)$
Symmetry	point Symmetry.	line symmetry.
End Behaviour	As $x \to \infty$, $y \to \infty$ As $x \to -\infty$, $y \to -\infty$	As $x \to \infty$, $y \to \infty$ As $x \to -\infty$, $y \to \infty$