Name: ____________________________ Date: ____________________

Learning Goal 3.1	Graphing and the characteristics of a graph (e.g. degree, extrema, zeros, end-behaviour).

Terminology

$4x^7 + 5x^2 + 8x^3 + 6x^0$

Degree	Leading Coefficient	Constant
the biggest exponent on a variable	the coefficient of the term with the biggest exponent	the term with no variable.

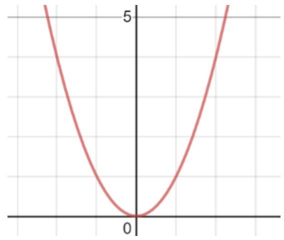
Example A polynomial function is a function that can be written in the form

$$f(x) = a_n x^n + a_{n-1}x^{n-1} + a_{n-2}x^{n-2} + \ldots + a_2x^2 + a_1x + a_0,$$

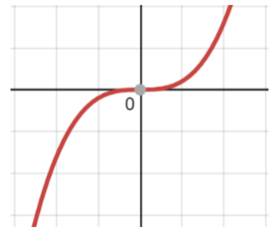
where n is a whole number, x is a variable, the coefficients a_n to a_0 are real numbers. Which of the following functions are polynomials? For those that are polynomial functions, state the **degree**, the **leading coefficient**, and the **constant term**.

Function	Type of Function	Degree	Leading Coefficient	Constant term
a. $g(x) = \sqrt{x} + 5$	Radical			
b. $h(x) = 2x^3 - 4x + \sqrt{8}$	cubic	3	2	$\sqrt{8}$
c. $f(x) = 3x^4$	Quadric	4	3	0
d. $k(x) = 3^x + 11$	exponential			
e. $f(x) = x - 7$	Linear	1	1	-7
f. $y = -0.2 \times x^0$	constant	0		-0.2
g. $g(x) = 5 + 4x + \cancel{\frac{1}{x}}\ x^{-1}$				
h. $y = 2x^3 + 3x^2 - 4x - 1$	cubic	3	2	-1
i. $f(x) = \frac{2}{3}x^4 - 5x^3 - 12x + 0.56$	Quadric	4	2/3	0.56
j. $y = 3x^{-2} + 4x^2 - 6$				

End behaviour or $\lim_{x \to \pm\infty} f(x)$

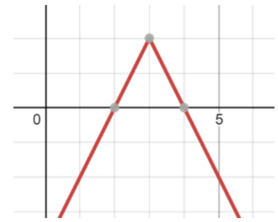


$\lim_{x \to \pm\infty} f(x) = +\infty$



$\lim_{x \to -\infty} f(x) = -\infty$

$\lim_{x \to +\infty} f(x) = +\infty$

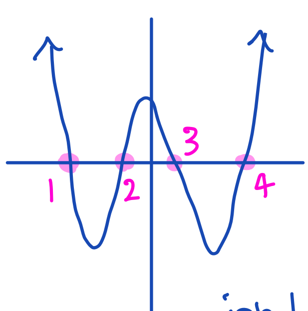


$\lim_{x \to \pm\infty} f(x) = -\infty$

Example Use DESMOS to graph each of the following polynomial functions and complete the table:

	$g(x) = -x^4 + 10x^2 + 5x - 4$	$f(x) = x^3 + x^2 - 5x + 3$
Polynomial Type	Polynomial of degree 4 or Quadric	Polynomial of degree 3 or Cubic
End Behaviour	$\lim_{x \to \pm\infty} g(x) = -\infty$	$\lim_{x \to -\infty} f(x) = -\infty$ $\lim_{x \to +\infty} f(x) = +\infty$
Domain *always the same*	$\{x \mid x \in \mathbb{R}\}$	$\{x \mid x \in \mathbb{R}\}$
Range *varies wildly*	$\{y \mid y < 32.477, y \in \mathbb{R}\}$	$\{y \mid y \in \mathbb{R}\}$
Number of $x-$intercepts	4	2
$y-$intercept	$y = -4$	$y = 3$
Maximum and/or Minimum Values	GLOBAL max $\doteq 32.477$ min: — Local max $y \doteq 10.152$ min $y \doteq -4.629$	NO GLOBAL Max/Min Local Max $y \doteq 9.481$, MIN $y = 0$

Example The $x-$intercepts of the graph of a function are the **zeros of the function**. We can find the zeros the function by graphing the function and determining the $x-$intercepts. Approximate the zeros of the function $f(x) = x^4 - 15x^2 + 20$ (to nearest tenth).



ish!

$x_1 \doteq -3.677 \doteq -3.7$

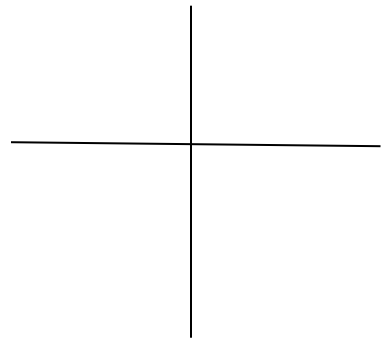
$x_2 \doteq -1.216 \doteq -1.2$

$x_3 \doteq 1.216 \doteq 1.2$

$x_4 \doteq 3.677 \doteq 3.7$

c) $p(x) = -2x^5 + 5x^3 - x$

Circle one: Constant/Linear/Quadratic/Cubic/Quartic/Quintic



End Behaviour:

Domain: *Range:*

Number of x-intercepts:

y-intercept:

max or min values ?

d) $h(x) = x^4 + 4x^3 - x^2 - 16x - 12$

Circle one: Constant/Linear/Quadratic/Cubic/Quartic/Quintic

End Behaviour:

Domain:

Range:

Number of x-intercepts:

y-intercept:

max or min values?

Assignment p. 114 #1 – 8, 10, 11, C2, C4 Quiz Next Day!