Polynomial Functions

- The exponents must be whole numbers

Ex: $f(x) = x^{4} - 3x^{3} + 2x^{2} - x^{1} + 1x^{0}$ all exponents are whole #'s

- The leading coefficient is the coefficient on the highest power of x
- The constant term is the term with no variable
- The degree is the highest exponent

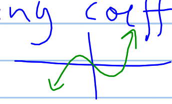
	Degree	Leading coeff	Constant
$y = 3x^{5} - x^{4} + 2$	5	3	2
$y = 2 - x^{4} + 3x^{5}$			
$y = 5x^{2} - 7x^{7} + 16x^{3}$	7	-7	0

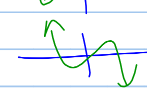
Even functions: have an even degree

- Both ends will point the same way
  - Both point up if the leading coeff is +ve
  - Both point down if the leading coeff is -ve
- Can have 0 → the degree of the f^n # of x-intercepts
- D: $x \in \mathbb{R}$ Range depends on which way it opens

Odd f^n's have an odd degree

- Ends point in diff. directions
- If the leading coefficient is:

Positive: 

negative 

- at least one x-intercept, as many as the degree
- D: $x \in \mathbb{R}$ R: $y \in \mathbb{R}$

What is $(x^2+7x+17) \div (x+3)$

$$
\begin{array}{r}
x + 4 \\
x+3 \,\big)\, \overline{x^2 + 7x + 17} \\
-(x^2 + 3x) \\
\hline
4x + 17 \\
-(4x + 12) \\
\hline
5
\end{array}
$$

$+ \frac{5}{x+3}$

$$\frac{x^2+7x+17}{x+3} = x+4 \text{ with a remainder of } 5$$

polynomial divided by

Quotient

remainder

$$\frac{P(x)}{x-a} = Q(x) + \frac{R}{x-a}$$

divisor

$P(x) = x^4 - 2x^3 + x^2 - 3x + 4$ divisor $x-1$

$$
\begin{array}{r}
x^3 - x^2 - 3 \\
x-1 \,\big)\, \overline{x^4 - 2x^3 + x^2 - 3x + 4} \\
-(x^4 - x^3) \\
\hline
-x^3 + x^2 \\
-(-x^3 + x^2) \\
\hline
0 - 3x + 4 \\
-(-3x + 3) \\
\hline
1
\end{array}
$$

If there is a missing power of x, you have to put in a zero for that term

so: $$\boxed{\frac{x^4 - 2x^3 + x^2 - 3x + 4}{x-1} = x^3 - x^2 - 3 + \frac{1}{x-1}}$$

missing powers

Ex $(3x^4 - x^2 + 1) \div (x+2)$

$x+2 \,\big)\, \overline{3x^4 + 0x^3 + x^2 + 0x + 1}$ ... and so on

3.1 & 3.2 up to #3