POLYNOMIALS | KEY POINTS

- This is an example of a ***polynomial***: $3x^4 + 2x^3 - 5x^2 + 7x - 2$
  - The ***powers*** must be ***positive whole numbers***.
- The ***highest power*** of x is called the ***degree*** of the polynomial.
  - The polynomial above has degree 4 (quartic).
- In the polynomial above, the numbers $3, 2, -5 \ldots$ are called ***coefficients***.

EXAMPLE	DEGREE	NAME
$\mathrm{f}(x) = 3$	0	Constant
$\mathrm{f}(x) = 2x - 5$	1	Linear
$\mathrm{f}(x) = 2x^2 - 5x + 4$	2	Quadratic
$\mathrm{f}(x) = -x^3 + 7x + 2$	3	Cubic
$\mathrm{f}(x) = 2.5x^4 - 7x^3 + x$	4	Quartic

SOLVING CUBIC EQUATIONS – A SPECIAL CASE | EXAMPLE PROBLEM PAIR

1A. Solve $x^3 - 2x^2 - 24x = 0$.

1B. Solve $2x^3 + 15x^2 + 25x = 0$.

THE FACTOR THEOREM | KEY POINTS

- If $\mathrm{f}(a) = 0$ then $(x - a)$ is a factor of $\mathrm{f}(x)$.
  - *Note: This rule is extended in year 2.*

THE FACTOR THEOREM | EXAMPLE PROBLEM PAIRS

2E. Show that $x + 3$ is a factor of $\mathrm{f}(x) = x^3 - 6x^2 - 9x + 54$

2P. Show that $x - 2$ is a factor of $\mathrm{g}(x) = x^3 - 5x^2 + x + 10$

3E. Two of the factors of $\mathrm{h}(x) = x^3 + 4x^2 + ax + b$ are $x - 1$ and $x + 1$. Find the values of the constants a and b.

3P. The polynomial $\mathrm{m}(x) = x^3 + cx^2 + dx - 2$ has factors $x - 1$ and $x - 2$. Using the Factor Theorem, find the values of c and d.

EQUATING COEFFICIENTS | KEY FACTS

- An ***identity*** is an equation that is ***true for any possible value***.
  - e.g. $3(2x + 5) \equiv 6x + 15$ (***three horizontal lines*** are used in an ***identity***).
- If $ax^3 + bx^2 + cx + d \equiv 5x^3 - 4x^2 - 2x + 3$, then $a = 5,\ b = -4,\ c = -2,$ and $d = 3$
  - This is called equating coefficients

4E. $\mathrm{f}(x) = 2x^3 - 3x^2 - 12x + 20$. Given that $x - 2$ is a factor of $\mathrm{f}(x)$, express $\mathrm{f}(x)$ as a product of three linear factors.

4P. Given that $x + 3$ is a factor of $\mathrm{g}(x) = x^3 - 6x^2 - 9x + 54$, express $\mathrm{g}(x)$ as a product of three linear factors.

5E. Solve the equation $\mathrm{p}(x) = x^3 - 5x^2 + 3x + 1 = 0$

5P. Solve the equation $\mathrm{q}(x) = x^3 + x^2 - 13x + 14 = 0$

6E. Use polynomial division to simplify $\dfrac{2x^3 - 5x - 6}{x - 2}$

6P. Use polynomial division to simplify $\dfrac{x^3 - x^2 - 11x - 4}{x - 4}$