Y12 Pure Chapter 4—Graphs and Transformations

Y12 – Chapter 4 Graphs and transformations

What do I need to be able to do?

By the end of this chapter you should be able to:

- Sketch cubic, quartic and reciprocal graphs
- Use intersection points to solve equations
- Translate graphs
- Stretch graphs
- Transform graphs of unfamiliar functions

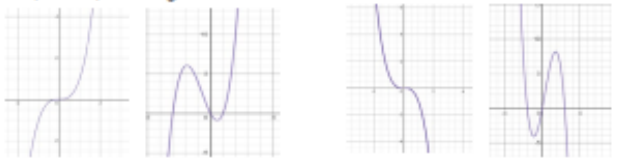
Key words:

- Cubic function– A function where the highest exponent (index/power) of the variable is a cube (3)
- Quartic function – A function where the highest exponent (index/power) of the variable is 4
- Reciprocal function – A function where the highest exponent (index/power) of the variable is negative
- Asymptote – A line that a curve approaches, as it heads towards infinity

Cubic graphs

Have the form: $ax^3 + bx^2 + cx + d$ where a, b, c and d are real numbers and a is non-zero

A cubic graph can have varying forms of the same basic shape depending on the nature of the function



For these two function a is positive | For these two function a is negative

Finding the roots and y intercept of the function helps sketch the function.

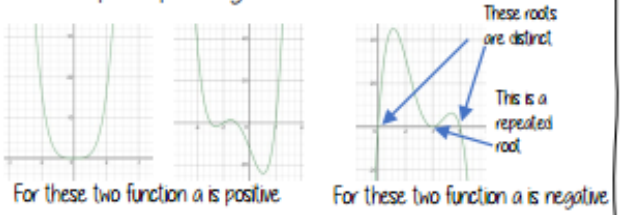
To find the roots substitute y = 0 into the function and solve

To find the y intercept substitute x=0 into the function and solve

Quartic graphs

Have the form: $ax^4 + bx^3 + cx^2 + dx + e$ where a, b, c, d and e are real numbers and a is non-zero

A quartic graph can have varying forms of the same basic shape depending on the nature of the function



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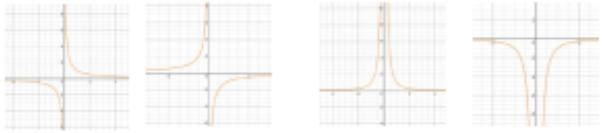
Reciprocal graphs

Have the form: $\frac{k}{x}$ or $\frac{k}{x^2}$ where k is a real constant.

Reciprocal graphs will have asymptotes. Reciprocal graphs in the form $\frac{k}{x}$ or $\frac{k}{x^2}$ will have asymptotes as x=0 and y =0



$y = \frac{k}{x}$ with k>0 | $y = \frac{k}{x}$ with k<0 | $y = \frac{k}{x^2}$ with k>0 | $y = \frac{k}{x^2}$ with k<0

Transformations of functions

Function	Transformation	Explanation
f(x)	None - original function	n/a
f(x) + a	Translation	Graph moves along y axis by the vector $\begin{pmatrix}0\\a\end{pmatrix}$
f(x+a)	Translation	Graph moves along x axis by the vector $\begin{pmatrix}-a\\0\end{pmatrix}$
af(x)	Stretch	Scale factor a in the vertical direction
f(ax)	Stretch	Scale factor $\frac{1}{a}$ in the horizontal direction
-f(x)	Reflection	Reflection of f(x) in the x-axis
f(-x)	Reflection	Reflection of f(x) in the y-axis