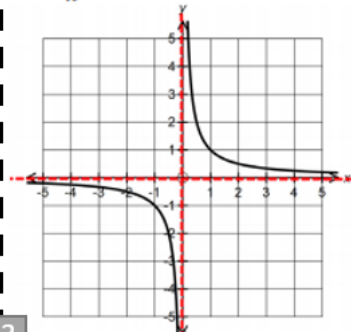


Graphs and Transformations

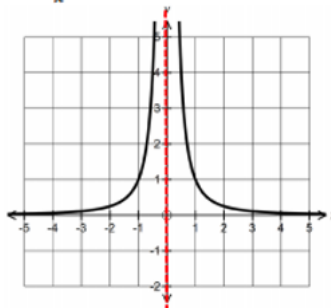
1

3 graphs to recognise

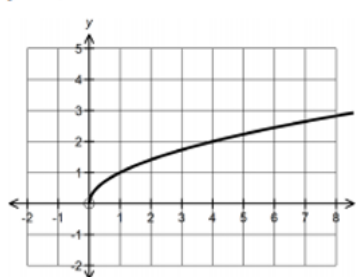
$$y = \frac{1}{x}$$



$$y = \frac{1}{x^2}$$



$$y = \sqrt{x}$$



3

STRETCHING

To stretch with scale factor k in the x direction (parallel to the x -axis) replace x with $\frac{1}{k}x$ $y = f(\frac{1}{k}x)$

To stretch with scale factor k in the y direction (parallel to the y -axis) replace y with $\frac{1}{k}y$ $y = kf(x)$

2

REFLECTION

To reflect in the x -axis replace y with $-y$ ($y = -f(x)$)

To reflect in the y -axis replace x with $-x$ ($y = f(-x)$)

The graph of $y = x^2 - 1$ is translated by vector $\begin{bmatrix} 3 \\ -2 \end{bmatrix}$. Write down the equation of the new graph

$$(y + 2) = (x - 3)^2 - 1$$

$$y = x^2 - 6x + 6$$

4

TRANSLATION

To find the equation of a graph after a translation of $\begin{bmatrix} a \\ b \end{bmatrix}$ replace x with $(x - a)$ and replace y with $(y - b)$

In function notation

$y = f(x)$ is transformed to $y = f(x - a) + b$

Vectors

1

A vector has two properties **magnitude** and **direction**.

Notation

Vectors can be written as

$$a = \begin{pmatrix} 3 \\ 4 \end{pmatrix} \quad a = 3i \text{ and } 4j$$

The **Magnitude** of vector a is denoted by $|a|$ and can be found using Pythagoras. A **Unit Vector** is a vector which has a magnitude of 1

2

ARITHMETIC WITH VECTORS

Addition of vectors

Multiplying by a scalar (number)

$$a = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \quad b = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$$

$$a = \begin{pmatrix} 3 \\ 2 \end{pmatrix} \quad 3i + 2j$$

$$2a = 2 \begin{pmatrix} 3 \\ 2 \end{pmatrix} = \begin{pmatrix} 6 \\ 4 \end{pmatrix} \quad 6i + 4j$$

a and $2a$ are **parallel** vectors

$$a + b = \begin{pmatrix} 2 \\ 3 \end{pmatrix} + \begin{pmatrix} 3 \\ 1 \end{pmatrix} = \begin{pmatrix} 5 \\ 4 \end{pmatrix}$$

Subtraction of vectors

$$a - b = \begin{pmatrix} 2 \\ 3 \end{pmatrix} - \begin{pmatrix} 3 \\ 1 \end{pmatrix} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$$



How do we use Knowledge Organisers in Mathematics?

How can you use knowledge organisers at home to help us?

- **Retrieval Practice:** Read over a section of the knowledge organiser, cover it up and then write down everything you can remember. Repeat until you remember everything.
- **Flash Cards:** Using the Knowledge Organisers to help on one side of a piece of paper write a question, on the other side write an answer. Ask someone to test you by asking a question and seeing if you know the answer.
- **Mind Maps:** Turn the information from the knowledge organiser into a mind map. Then reread the mind map and on a piece of paper half the size try and recreate the key phrases of the mind map from memory.
- **Sketch it:** Draw an image to represent each fact; this can be done in isolation or as part of the mind map/flash card.
- **Teach it:** Teach someone the information on your knowledge organiser, let them ask you questions and see if you know the answers.

How will we use knowledge organisers in Mathematics?

Knowledge organisers will be used before I complete a Learning Check or Common Assessment. I will spend part of the lesson looking over each of the key topics of the half term before completing the Learning Check or Common Assessment.

I will also use these at home to complete my own independent learning and revision of these key topics.

GLUE HERE