Year 13: Half Term 5 – Numerical Methods

Numerical Methods

1

CHANGE OF SIGN – locating a root

For an equations $f(x) = 0$, if $f(x_1)$ and $f(x_2)$ have opposite signs and $f(x)$ is a **continuous function** between x_1 and x_2 then a root of the equation lies in the interval $x_1 < x < x_2$

2

STAIRCASE and COWBEB DIAGRAMS

If an **iterative formula** (recurrence relation) of the form $x_{n+1}=f(x_n)$ converges to a limit, the value of the limit is the x-coordinate of the point of intersection of the graphs $y = f(x)$ and $y = x$

The limit is the solution of the equation $f(x) = x$

3

NEWTON-RAPHSON iteration $f(x) = 0 \quad x_{n+1} = x_n - \frac{f(x_n)}{f\prime(x_n)}$

3

TRAPEZIUM RULE – given in the formula book but make sure you know how to use it!

The trapezium rule gives an approximation of the area under a graph

$$\int_a^b y\,dx \approx \frac{1}{2}h[(y_{0+}y_n) + 2(y_1 + y_2 + \ldots y_{n-1})] \quad \text{where } h = \frac{b-a}{n}$$

An easy way to calculate the y values is to use the TABLE function on a calculator – make sure you list the values in the formula (or a table) to show your method

- The rule will **underestimate** the area when the curve is **concave**
- The rule will **overestimate** the area when the curve is **convex**

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