

Name: _____

GCSE (1 – 9)

Iteration

Instructions

- Use **black** ink or ball-point pen.
- Answer all questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working out.**

Information

- The marks for each question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end

1 The number of rabbits in a field t days from now is P_t where

$$P_0 = 220$$

$$P_{t+1} = 1.15(P_t - 20)$$

Work out the number of rabbits in the garden 3 days from now.

.....
(Total for question 1 is 3 marks)

2 The number of people living in a town t years from now is P_t where

$$P_0 = 55000$$

$$P_{t+1} = 1.03(P_t - 800)$$

Work out the number of people in the town 3 years from now.

.....
(Total for question 2 is 3 marks)

3 Using $x_{n+1} = 3 + \frac{9}{x_n^2}$

With $x_0 = 3$

Find the values of x_1 , x_2 and x_3 .

$x_1 = \dots\dots\dots$

$x_2 = \dots\dots\dots$

$x_3 = \dots\dots\dots$

(Total for question 3 is 3 marks)

4 Using $x_{n+1} = \frac{5}{x_n^2 + 3}$

With $x_0 = 1$

Find the values of x_1 , x_2 and x_3 .

$x_1 = \dots\dots\dots$

$x_2 = \dots\dots\dots$

$x_3 = \dots\dots\dots$

(Total for question 4 is 3 marks)

- 5 Starting with $x_0 = 3$, use the iteration formula $x_{n+1} = \frac{7}{x_n^2} + 2$ three times to find an estimate for the solution to $x^3 - 2x^2 = 7$

.....
(Total for question 5 is 3 marks)

- 6 Starting with $x_0 = 0$, use the iteration formula $x_{n+1} = \frac{2}{x_n^2 + 3}$ three times to find an estimate for the solution to $x^3 + 3x = 2$

.....
(Total for question 6 is 3 marks)

7 Using $x_{n+1} = \frac{5}{x_n^2} + 2$

With $x_0 = 2.5$

(a) Find the values of x_1 , x_2 and x_3 .

$x_1 = \dots\dots\dots$

$x_2 = \dots\dots\dots$

$x_3 = \dots\dots\dots$

(3)

(b) Explain the relationship between the values of x_1 , x_2 and x_3 and the equation $x^3 - 2x^2 - 5 = 0$

.....
.....
.....

(2)

(Total for question 7 is 5 marks)

8 (a) Show that the equation $2x^3 - x^2 - 3 = 0$ has a solution between $x = 1$ and $x = 2$.

(2)

(b) Show that the equation $2x^3 - x^2 - 3 = 0$ can be rearranged to give: $x = \sqrt{\frac{3}{2x-1}}$

(1)

(c) Starting with $x_0 = 1$, use the iteration formula $x_{n+1} = \sqrt{\frac{3}{2x_n-1}}$ twice to find an estimate for the solution to $2x^3 - x^2 - 3 = 0$

.....
(3)

(Total for question 8 is 6 marks)

9 Using $x_{n+1} = 1 + \frac{1}{x_n^2}$

With $x_0 = 2$

(a) Find the values of x_1 , x_2 and x_3 .

$x_1 = \dots\dots\dots$

$x_2 = \dots\dots\dots$

$x_3 = \dots\dots\dots$

(3)

(b) Explain the relationship between the values of x_1 , x_2 and x_3 and the equation $x^3 - x^2 - 1 = 0$

.....
.....
.....

(2)

(Total for question 9 is 5 marks)

10 (a) Show that the equation $x^3 + 4x = 1$ has a solution between $x = 0$ and $x = 1$.

(2)

(b) Show that the equation $x^3 + 4x = 1$ can be rearranged to give: $x = \frac{1}{4} - \frac{x^3}{4}$

(1)

(c) Starting with $x_0 = 0$, use the iteration formula $x_{n+1} = \frac{1}{4} - \frac{x_n^3}{4}$ twice to find an estimate for the solution to $x^3 + 4x = 1$

.....
(3)

(Total for question 10 is 6 marks)