

Iteration

For Pearson Edexcel GCSE Mathematics (1MA1) • Higher tier

Name _____

Total marks: **26**

Answer **all** questions in the spaces provided. Show your working: marks are given for correct method. You may use a calculator.

- 1** Using $x_{n+1} = \sqrt{3x_n + 5}$ with $x_0 = 4$, find the values of x_1 , x_2 and x_3
Give your answers correct to 3 decimal places.

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(3)

(Total for Question 1 is 3 marks)

- 2 (a) Show that the equation $x^3 + x^2 - 6 = 0$ has a solution between 1 and 2

(2)

- (b) Show that the equation $x^3 + x^2 - 6 = 0$ can be rearranged to give $x = \sqrt{\frac{6}{x+1}}$

(2)

- (c) Starting with $x_0 = 1.5$, use the iteration formula $x_{n+1} = \sqrt{\frac{6}{x_n+1}}$ three times to find an estimate for a solution of $x^3 + x^2 - 6 = 0$

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(3)

- (d) By substituting your answer to part (c) into $x^3 + x^2 - 6$, comment on the accuracy of your estimate for the solution to $x^3 + x^2 - 6 = 0$

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.....
(2)

(Total for Question 2 is 9 marks)

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- 3 (a) Show that the equation $x^3 - 4x - 9 = 0$ can be written in the form $x = \sqrt{4 + \frac{9}{x}}$

(1)

- (b) Starting with $x_0 = 3$

use the iteration formula $x_{n+1} = \sqrt{4 + \frac{9}{x_n}}$ three times to find an estimate for a solution of $x^3 - 4x - 9 = 0$

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(3)

(Total for Question 3 is 4 marks)

- 4 (a) Use the iteration formula $x_{n+1} = 4 - \frac{1}{x_n^2}$ to find the values of x_1 , x_2 and x_3
Start with $x_0 = 4$

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(3)

- (b) The values of x_1 , x_2 and x_3 found in part (a) are estimates of a solution of an equation of the form $x^3 + px^2 + q = 0$ where p and q are integers.
Find the value of p and the value of q .

$p = \dots\dots\dots$ $q = \dots\dots\dots$
(1)

(Total for Question 4 is 4 marks)

- 5 (a) Show that the equation $x^3 - 3x^2 - 2 = 0$ has a solution between $x = 3$ and $x = 4$

(2)

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

(1)

- (c) Starting with $x_0 = 3.2$

use the iteration formula $x_{n+1} = \sqrt[3]{3x_n^2 + 2}$ twice to find an estimate for the solution of $x^3 - 3x^2 - 2 = 0$

Give your answer correct to 4 decimal places.

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(3)

(Total for Question 5 is 6 marks)