HIGHER

7.10 Iteration: 10-minute Pack

EDEXCEL 1MA1 · Calculator allowed · about 10 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Show that the polynomial $f(x) = x^4 - 3x + 1$ has a root between $x = 0$ and $x = 1$.

(Total for Question 1 is 1 mark)

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2 Use the iteration $x_{n+1} = (x_n + 2/x_n)/2$ to approximate $\sqrt{2}$. Start with $x_0 = 1.5$. Find x_2 to 3 decimal places.

(Total for Question 2 is 3 marks)

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3 A sequence is defined by $x_0 = 3$ and $x_{n+1} = (3x_n + 3)^{1/3}$. Work out x_1 and x_2. Give your answers correct to 3 decimal places.

(Total for Question 3 is 3 marks)

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4 Show that the equation $x^2 - 5x - 11 = 0$ can be rearranged into the form $x = \sqrt{px + q}$, where p and q are integers. State the rearranged equation.

(Total for Question 4 is 2 marks)

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Mark scheme · 7.10 Iteration: 10-minute Pack

Question 1

f(0) = 1 and f(1) = -1 so signs differ, hence a root in (0,1) **B1**
cao

Answer: f(0) = 0 - 0 + 1 = 1, f(1) = 1 - 3 + 1 = -1. Since f(0) > 0 and f(1) < 0 there is a root between 0 and 1.

Question 2

calculate $x_1 = (1.5 + 2/1.5)/2$ correctly **M1**

calculate x_2 using x_1 **M1**

$x_2 = 1.414$ (3 dp) cao **A1**

Answer: $x_1 = (1.5 + 1.3333333)/2 = 1.4166667$; x_2 approx $(1.4166667 + 2/1.4166667)/2$ approx 1.4142157 -> 1.414 (3 dp)

Question 3

substitutes $x_0 = 3$ **M1**

$x_1 = 2.289$ **A1**

$x_2 = 2.145$ **A1**

Answer: $x_1 = 2.289$, $x_2 = 2.145$

Question 4

isolates a term in x correctly **M1**

$x = \sqrt{5x + 11}$ **A1**

Answer: $x = \sqrt{5x + 11}$

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