Iteration

SCAN ME

REVISE THIS TOPIC

1 A sequence of numbers if formed by the iterative process

$$u_{n+1} = \sqrt{\frac{u_n}{10} + 2} \qquad u_1 = 42.5$$

Work out the values of u_2 and u_3 **[2 marks]**

$u_2 = \sqrt{\frac{42.5}{10} + 2}$ $u_3 = \sqrt{\frac{2.5}{10} + 2}$

$u_2 = 2.5$ $u_3 = 1.5$

$u_2 =$ 2.5

$u_3 =$ 1.5

2 A sequence of numbers if formed by the iterative process

$$u_{n+1} = \frac{(u_n)^2 + 3}{5} \qquad u_1 = \sqrt{3}$$

Work out the values of u_2 and u_3 **[2 marks]**

$u_2 = \frac{(\sqrt{3})^2 + 3}{5}$ $u_3 = \frac{1.2^2 + 3}{5}$

$u_2 = 1.2$ $= 0.888$

$u_2 =$ 1.2

$u_3 =$ 0.888

$\overline{\quad 4}$

3 A sequence of numbers if formed by the iterative process

$u_{n+1} = \sqrt{80 - 5u_n}$ $u_1 = 12.8$

Work out the values of u_2 and u_3 **[2 marks]**

$u_2 = \sqrt{80 - 5(12.8)}$ $u_3 = \sqrt{80 - 5(4)}$

$u_2 = 4$ $u_3 = 7.74596...$

$u_2 =$ 4

$u_3 =$ 7.745966692

4 A sequence of numbers if formed by the iterative process

$u_{n+1} = 4u_n - (u_n)^2$ $u_1 = 0.3$

Work out the values of u_2 and u_3 **[2 marks]**

$u_2 = 4(0.3) - 0.3^2$ $u_3 = 4(1.11) - 1.11^2$

$u_2 = 1.11$ $u_3 = 3.2079$

$u_2 =$ 1.11

$u_3 =$ 3.2079

5 An approximate solution to an equation is found using the iterative formula

$$x_{n+1} = \sqrt[3]{x_n + 4} \qquad \text{with} \qquad x_1 = 2$$

5 (a) Work out the values of x_2 and x_3
Write down all the figures on your calculator display. **[2 marks]**

$x_2 = \sqrt[3]{2+4}$ $\quad$ $x_3 = \sqrt[3]{1.817... + 4}$

$x_2 = 1.817120593$ $\quad$ $x_3 = 1.798467893$

$x_2 =$ 1.817120593

$x_3 =$ 1.798467893

5 (b) Work out the solution to the equation to 5 decimal places. **[1 mark]**

Continue iterations

$x = 1.796321903$

$x =$ 1.79632

7

Turn over ►

6 An approximate solution to an equation is found using the iterative formula

$$x_{n+1} = \sqrt{13 - x_n} \qquad \text{with} \qquad x_1 = 3$$

6 (a) Work out the values of x_2 and x_3
Write down all the figures on your calculator display. **[2 marks]**

$x_2 = \sqrt{13-3}$ $\qquad$ $x_3 = \sqrt{13 - 3.16...}$

$x_2 = 3.16227766$ $\qquad$ $x_3 = 3.136514361$

$x_2 =$ 3.16227766

$x_3 =$ 3.136514361

6 (b) Work out the solution to the equation to 3 decimal places. **[1 mark]**

continue iterations

$x = 3.140054945$

$x =$ 3.140

7 An approximate solution to an equation is found using the iterative formula

$$x_{n+1} = \frac{(x_n)^2 + 6}{10} \qquad \text{with} \qquad x_1 = 1$$

7 (a) Work out the values of x_2 and x_3 **[2 marks]**

$x_2 = \frac{1^2+6}{10}$ $x_3 = \frac{0.7^2+6}{10}$

$x_2 = 0.7$ $x_3 = 0.649$

$x_2 =$ 0.7

$x_3 =$ 0.649

7 (b) Work out the solution to the equation to 4 decimal places. **[1 mark]**

continue iterations

$x = 0.6411010565$

$x =$ 0.6411

6

Turn over ►

8 An approximate solution to an equation is found using the iterative formula

$$x_{n+1} = 10 - \sqrt{\frac{8}{x_n}} \qquad \text{with} \qquad x_1 = 2$$

8 (a) Work out the values of x_2 and x_3 **[2 marks]**

$x_2 = 10 - \sqrt{\frac{8}{2}}$ $x_3 = 10 - \sqrt{\frac{8}{8}}$

$x_2 = 8$ $x_3 = 9$

$x_2 =$ 8

$x_3 =$ 9

8 (b) Work out the solution to the equation to 5 decimal places. **[1 mark]**

continue iterations

$x = 9.060335423$

$x =$ 9.06034

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