

Section 1: Solving equations numerically

Exercise level 1

1. Show that a root α of the equation $e^x - 3x + 0.2 = 0$ lies between 1.34 and 1.35.
2. Show that a root of the equation $x^3 - 7x - 12 = 0$ is 3.267 correct to 3 decimal places.
3. The equation $x^3 - x - 1 = 0$ has one real root near $x = 1$.
 - (i) Show that the equation can be rearranged into the form $x = (1+x)^{1/3}$.
 - (ii) Using the iterative formula $x_{n+1} = (1+x_n)^{1/3}$ and initial approximation $x_0 = 1$, find the values of x_2, x_3, x_4, x_5 and x_6 .
 - (iii) Use your results from (ii) to state the value this root to 3 d.p., and use a change of sign method to verify that your root is indeed correct to 3 d.p.
4.
 - (i) By drawing the curve $y = \sin x$ and the line $2y = 2x - 1$ show that the equation $2\sin x - 2x + 1 = 0$ has one real root only.
 - (ii) Find the root to 3 d.p. using the iterative formula $x_{n+1} = \sin x_n + 0.5$.
 - (iii) Use a change of sign method to verify that your root is indeed correct to 3 d.p.