Differentiation & Applications (Q 6 & 7, Paper 1)

Lesson No. 13: Newton-Raphson Approximation

2006

7 (a) Taking $x_1 = 2$ as the first approximation to the real root of the equation $x^3 + x - 9 = 0$, use the Newton-Raphson method to find x_2, the second approximation.

2005

7 (c) (i) Write down a quadratic equation whose roots are $\pm\sqrt{k}$.

(ii) Hence use the Newton-Raphson method to show that the rule $u_{n+1} = \dfrac{(u_n)^2 + k}{2u_n}$ can be used to find increasingly accurate approximations for $\sqrt{k}$.

(iii) Using the above rule and taking $\frac{3}{2}$ as the first approximation for $\sqrt{3}$, find the third approximation, as a fraction.

2003

6 (b) Show that the equation $x^3 - 4x - 2 = 0$ has a root between 2 and 3.
Taking $x_1 = 2$ as the first approximation to this root, use the Newton-Raphson method to find x_3, the third approximation. Give your answer correct to two decimal places.

2001

7 (a) Taking $x_1 = 1$ as the first approximation to the real root of the equation $x^3 + x^2 - 1 = 0$, use the Newton-Rhapson method to find x_2, the second approximation.

Answers

2006 7 (a) $\frac{25}{13}$

2005 7 (c) (i) $x^2 - k = 0$ (iii) $\frac{97}{56}$

2003 6 (b) $x_3 = 2 \cdot 22$

2001 7 (a) $x_2 = \frac{4}{5} = 0 \cdot 8$