

FP1 Numerical Solutions of Equations Questions

- 1 (a) Show that the equation

$$x^3 + 2x - 2 = 0$$

has a root between 0.5 and 1.

(2 marks)

- (b) Use linear interpolation once to find an estimate of this root. Give your answer to two decimal places. (3 marks)
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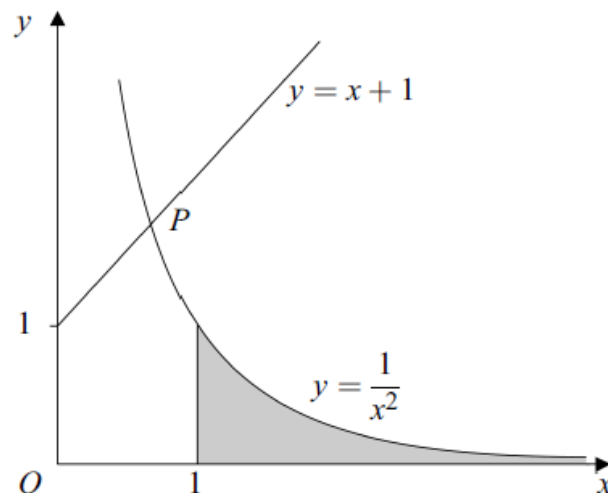
- 2 A curve satisfies the differential equation

$$\frac{dy}{dx} = \log_{10} x$$

Starting at the point (2, 3) on the curve, use a step-by-step method with a step length of 0.2 to estimate the value of y at $x = 2.4$. Give your answer to three decimal places. (6 marks)

- (b) The diagram shows the graphs of

$$y = \frac{1}{x^2} \quad \text{and} \quad y = x + 1 \quad \text{for} \quad x > 0$$



The graphs intersect at the point P .

- (i) Show that the x -coordinate of P satisfies the equation $f(x) = 0$, where f is the function defined in part (a). (1 mark)

- (ii) Taking $x_1 = 1$ as a first approximation to the root of the equation $f(x) = 0$, use the Newton–Raphson method to find a second approximation x_2 to the root. *(3 marks)*
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- 2 (a) Show that the equation

$$x^3 + x - 7 = 0$$

has a root between 1.6 and 1.8. *(3 marks)*

- (b) Use interval bisection **twice**, starting with the interval in part (a), to give this root to one decimal place. *(4 marks)*