

C1 January 2005

10. Given that $f(x) = x^2 - 6x + 18, \quad x \geq 0,$

(a) express $f(x)$ in the form $(x - a)^2 + b$, where a and b are integers. **(3)**

The curve C with equation $y = f(x), x \geq 0$, meets the y -axis at P and has a minimum point at Q .

(b) Sketch the graph of C , showing the coordinates of P and Q . **(4)**

The line $y = 41$ meets C at the point R .

(c) Find the x -coordinate of R , giving your answer in the form $p + q\sqrt{2}$, where p and q are integers. **(5)**

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7. (a) Show that $\frac{(3-\sqrt{x})^2}{\sqrt{x}}$ can be written as $9x^{-\frac{1}{2}} - 6 + x^{\frac{1}{2}}$. **(2)**

Given that $\frac{dy}{dx} = \frac{(3-\sqrt{x})^2}{\sqrt{x}}$, $x > 0$, and that $y = \frac{2}{3}$ at $x = 1$,

(b) find y in terms of x . **(6)**

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3. Find, giving your answer to 3 significant figures where appropriate, the value of x for which

(a) $3^x = 5$, **(3)**

(b) $\log_2(2x + 1) - \log_2 x = 2$. **(4)**

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8. (a) Find all the values of θ , to 1 decimal place, in the interval $0^\circ \leq \theta < 360^\circ$ for which

$$5 \sin (\theta + 30^\circ) = 3. \quad (4)$$

- (b) Find all the values of θ , to 1 decimal place, in the interval $0^\circ \leq \theta < 360^\circ$ for which

$$\tan^2 \theta = 4. \quad (5)$$
