

2. Given that

$$f(x) = x^2 - 4x + 5 \quad x \in \mathbb{R}$$

(a) express $f(x)$ in the form $(x + a)^2 + b$ where a and b are integers to be found.

(2)

The curve with equation $y = f(x)$

- meets the y -axis at the point P
- has a minimum turning point at the point Q

(b) Write down

- the coordinates of P
- the coordinates of Q

(2)

(a) $f(x) = x^2 - 4x + 4 - 4 + 5$

\downarrow
 $\frac{-4}{2} = -2 \Rightarrow (-2)^2 = 4$

$= \underbrace{(x-2)^2}_{+1}$ (2 marks)

(b)(i) $f(x)$ meets y -axis when $x = 0$

$$f(0) = (0-2)^2 + 1 = 5, \text{ so } P \text{ is } (0, 5) \quad (1 \text{ mark})$$

(b)(ii) $(x-2)^2 \geq 0$ with minimum $= 0$ when $x = 2$

$$f(x) = (x-2)^2 + 1 \geq 0 + 1 \geq 1$$

, so Q is $(2, 1)$ (1 mark)