3 You are given that

$f(x) = 4 + x^2$ on the domain $\{x : x \in \mathbb{R}, x \geqslant 0\}$.

(a) Find the range of f. **[1]**

(b) Explain why the function $g(x) = x^2 + 4, x \in \mathbb{R}$ does **not** have an inverse. **[1]**

(c) Find an expression for $f^{-1}(x)$. **[2]**

(d) **(i)** Show that the quadratic equation $x^2 + 4 = x$ has **no** real roots. **[1]**

(ii) Hence explain how you can be sure that the equation $f(x) = f^{-1}(x)$ has **no** real roots. **[1]**

(e) Sketch the graphs of $y = f(x)$ and $y = f^{-1}(x)$ on the diagram in the Printed Answer Booklet. **[2]**