The function $f(x) = 2^x + 3$ is defined on $\mathbb{R}$, the set of real numbers.

The graph with equation $y = f(x)$ passes through the point P$(1, b)$ and cuts the y-axis at Q as shown in the diagram.
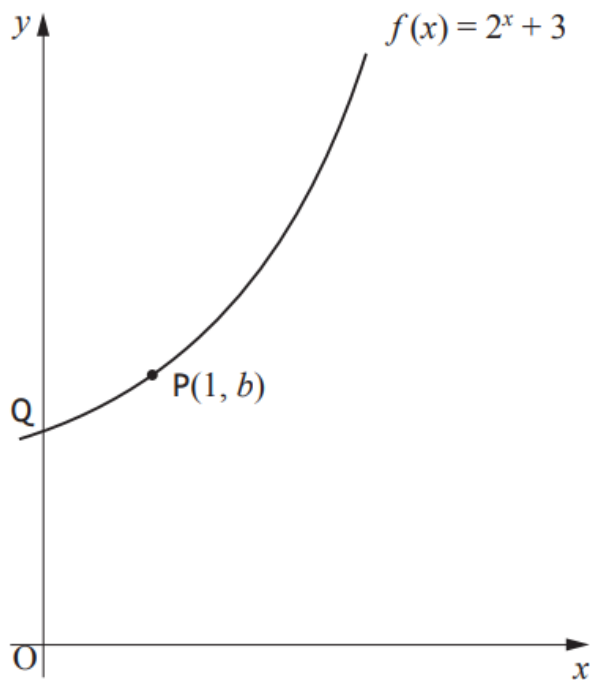
(a) What is the value of b? **1**

(b)   (i) Copy the above diagram.

       On the same diagram, sketch the graph with equation $y = f^{-1}(x)$. **1**

   (ii) Write down the coordinates of the images of P and Q. **3**

(c) R$(3, 11)$ also lies on the graph with equation $y = f(x)$.

Find the coordinates of the image of R on the graph with equation
$y = 4 - f(x + 1)$. **2**

Answers:

(a) $b = 5$ (b) (i) Reflection in the line $y = x$.   (ii) P$(5, 1)$ Q$(4, 0)$ (c) R$(2, -7)$