The domain of a function is the set of $x$ values we are allowed to "feed" a function. Provided the function is defined, we are allowed to choose the domain.

**e.g.** $f(x) = 2x + 3, \ x > 3$  

This is the domain we have chosen.

A sketch of this graph would look like this:

![Graph](image)

$\text{However, we have only allowed the function } f \text{ to be defined for } x > 3$

$F(3) = 2(3) + 3 = 9$

Notice to illustrate the graph continues forever, the line has just wandered off the grid.

**e.g.** An incorrect domain for a real function

$g(x) = \sqrt{x+3}, \ x \in \mathbb{R}$

Cannot be correct as undefined for $x < -3$
The range of a function is the set of \( y \) values \( y = f(x) \) can take, given a particular domain.

e.g. Sketch \( y = x^2 + 2x + 7 \) for \( x \in \mathbb{R} \) and state its range.

\[
\begin{align*}
\text{Input in quadratic solver} & \quad \text{No real roots} \\
\text{Min of } y = ax^2 + bx + c & \quad x = -1 + \sqrt{6}i \\
\text{Min of } y = ax^2 + bx + c & \quad x = -1 \\
\text{Min of } y = ax^2 + bx + c & \quad y = 6
\end{align*}
\]

\[\begin{aligned}
\text{Sketch needed} & \quad \text{to obtain range} \\
\end{aligned}\]

\[\text{range is } y \geq 6 \quad f(x) \geq 6\]

e.g. Find the range of \( g(x) = e^x \), \( x \geq 2 \)

\[g(2) = e^2 \quad \therefore g(x) \geq e^2\]
The function \( f \) is defined by \( f(x) = 2 - \sqrt{x} \) for \( x \geq 0 \). The graph of \( y = f(x) \) is shown above.

(i) State the range of \( f \).

\[
 f(0) = 2 - \sqrt{0} = 2 \quad \therefore \quad f(x) \leq 2 \quad \quad [1]
\]

(ii) Find the value of \( f(4) \).

\[
 f(4) = 2 - \sqrt{4} = 2 \quad \quad [2]
\]