# Functions Domain & Range

Remember: The domain of a function is the set of values $x$ can take. The range of a function is the set of values $f(x)$ can take. If you have a quadratic function the vertex is a particularly useful thing to work out. A sketch of your function ($y = f(x)$) is also vital.

A domain is *always* a statement involving $x$ (e.g. $-1 \leqslant x < 5$) and the range is *always* a statement involving $f(x)$ (e.g. $f(x) \leqslant 3$).

1. Given $f(x) = x + 3$, find the natural domain of $f(x)$. 　　$\boxed{x \in \mathbb{R}}$

2. Given $f(x) = \sqrt{x - 5}$, find the natural domain of $f(x)$. 　　$\boxed{x \geqslant 5}$

3. Given $f(x) = \sqrt{2x + 11}$, find the natural domain of $f(x)$. 　　$\boxed{x \geqslant -\frac{11}{2}}$

4. Given $f(x) = \sqrt{12 - 3x} + 5$, find the natural domain of $f(x)$. 　　$\boxed{x \leqslant 4}$

5. Given $f(x) = (x + 3)^2 + 1$, find the range of $f(x)$. 　　$\boxed{f(x) \geqslant 1}$

6. Given $f(x) = x^2 + 8x + 1$, find the range of $f(x)$. 　　☐

7. Given $f(x) = 2x^2 - 12x - 3$, find the range of $f(x)$. 　　☐

8. Given $f(x) = -x^2 - 2x + 10$, find the range of $f(x)$. 　　☐

9. Given $f(x) = 2 + \sqrt{x + 3}$, find the natural domain of $f(x)$. Find the range of $f(x)$. 　　☐

10. Given $f(x) = x^2 - 4x + 3$, where the domain is restricted to $x \geqslant 3$, find the range of $f(x)$. 　　☐

11. Given $f(x) = x^2 + 8x + 1$, where the domain is restricted to $x \leqslant -1$, find the range of $f(x)$. 　　☐

12. Given $f(x) = \sin x$, where the domain is restricted to $30 < x < 90$, find the range of $f(x)$. 　　☐

13. Given $f(x) = -\tan x$, where the domain is restricted to $30 \leqslant x < 90$, find the range of $f(x)$. 　　☐

14. Given $f(x) = \frac{2}{x+1}$, where the domain is restricted to $x \geqslant 0$, find the range of $f(x)$. 　　☐

15. Given $f(x) = -10^{x-1}$, where the domain is restricted to $x \leqslant 3$ find the range of $f(x)$. 　　☐

16. Given $f(x) = x(x - 1)(x + 3)$, where the domain is restricted to $x \geqslant 2$ find the range of $f(x)$. 　　☐

17. Given $f(x) = (x - 2)^2(x + 2)^2$, where the domain is restricted to $-2 \leqslant x \leqslant 2$ find the range of $f(x)$. 　　☐