Domain and range

6 questions | 12 marks

Equivalent correct methods earn the corresponding marks.

1. State the real domain of $f(x) = 5/(x + 3)$. [2 marks]

Exclude the input that makes x+3 zero.

Answer: $x \in \mathbb{R}$, $x \neq -3$.

2. State the real domain of $g(x) = \sqrt{7 - 2x}$. [2 marks]

Require $7 - 2x \geq 0$, then solve the inequality.

Answer: $x \leq 7/2$.

3. Find the range of $p(x) = -(x + 2)^2 + 9$ for all real x. [2 marks]

A square is non-negative; its negative is non-positive. Equality occurs at x=-2.

Answer: $p(x) \leq 9$.

4. Find the range of $q(x) = 3x - 1$ on $2 \leq x \leq 5$. [2 marks]

The function increases; $q(2) = 5$ and $q(5) = 14$.

Answer: $5 \leq q(x) \leq 14$.

5. Simplify $(x^2 - 9)/(x - 3)$ and retain its original domain restriction. [2 marks]

Factor the numerator as (x-3)(x+3).

Cancellation is valid only when x-3 is non-zero.

Answer: $x + 3$, with $x \neq 3$.

6. A square has perimeter P=4s. State a sensible domain and range when side length s is measured in centimetres. [2 marks]

A non-degenerate square has positive side length, and multiplying by 4 preserves positivity.

Answer: $s > 0$ and $P > 0$.