# BAE Math 1 Exercises

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**Exercise 1.**
Determine the domain and the range of the following functions of a real variable:
$$f(x) = \sqrt{x+4}; \qquad f(x) = |x^2 - 4| + 1$$

**Exercise 2.**
Determine the domain of the following functions of a real variable:

$$f(x) = 3x^2 - 4x + 7; \qquad f(x) = \frac{1}{2x^2 + 5x - 3};$$

$$f(x) = \sqrt{3x+2} + \sqrt{4x}; \qquad f(x) = \sqrt{\frac{x+1}{x^2 - 8x}};$$

$$f(x) = \ln(x^2 - 4x - 12); \qquad f(x) = \sqrt{\ln(x+3)};$$

**Exercise 3.**
Determine if the following functions are injective, surjective, bijective or none of the three and find the inverse function, in case it exists:

$$\begin{aligned} f: \ & \mathbb{R} \longrightarrow \mathbb{R} \\ & x \to 2x - 1 \end{aligned}$$

$$\begin{aligned} f: \ & \mathbb{R} \longrightarrow \mathbb{R} \\ & x \to x^2 - 2x \end{aligned}$$

$$\begin{aligned} f: \ & \mathbb{R}\backslash\{4\} \longrightarrow \mathbb{R} \\ & x \to \frac{x+3}{x-4} \ ; \end{aligned}$$

$$\begin{aligned} f: \ & \mathbb{R}\backslash\{3\} \longrightarrow \mathbb{R}\backslash\{2\} \\ & x \to \frac{2x-1}{x-3} \ ; \end{aligned}$$

**Exercise 4.**
Sketch a graph of the following functions, determine their range and say if they are injective, surjective, bijective or none of the three:

$$f(x) = \begin{cases} x+1 & \text{if } x < -2 \\ -2x-3 & \text{if } x \geq -2 \end{cases} \qquad f(x) = \begin{cases} 1+2x & \text{if } x < 0 \\ 1 & \text{if } 0 \leq x \leq 2 \\ \dfrac{x}{2} & \text{if } x > 2 \end{cases}$$