

$f(x) = \begin{cases} a + x, & x < 2 \\ x^2 - 3 & x \geq 2 \end{cases}$ describes a family of functions that are specified by the constant a .

1a) Draw the graph of $f(x)$ when $a = 0$.

1b) Prove that $f(x)$ is discontinuous when $a = 0$.

1c) For what value of a would the resulting $f(x)$ be continuous? Explain your reasoning.

1d) For which values of a is $f(x)$ a function? For which values of a is $f(x)$ invertible?

$g(x) = \begin{cases} bx, & x < \pi/2 \\ 1 - 3 \sin 2x & x \geq \pi/2 \end{cases}$ describes a family of functions that are specified by the constant b .

2a) Draw the graph of $g(x)$ when $b = 0$.

2b) Prove that $g(x)$ is discontinuous when $b = 0$.

2c) For what value of b would the resulting $g(x)$ be continuous? Explain your reasoning.

2d) For which values of b is $g(x)$ a function? For which values of b is $g(x)$ invertible?