

$f(x) = \begin{cases} a + x, & x < 2 \\ x^2 - 3 & x \geq 2 \end{cases}$  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?