

List of Exercises 2

1. Find the domain and range of the following functions. Give a brief sketch of each one of them:

<b>(a)</b> $f(x) = x^2 + 3x - 4$	<b>(b)</b> $g(x) = \sqrt{5 - x}$	<b>(c)</b> $h(x) = \frac{2x}{x^2+1}$
<b>(d)</b> $k(x) =  x + 2 $	<b>(e)</b> $m(x) = \frac{\sqrt{x-1}}{x+3}$	<b>(f)</b> $n(x) = \frac{1}{x^2-4}$
<b>(g)</b> $p(x) = \sqrt{x^2 - 9}$	<b>(h)</b> $q(x) = \frac{ x }{x}$	<b>(i)</b> $r(x) = \frac{2}{\sqrt{x+3}}$
<b>(j)</b> $s(x) = x^3 - 8x$	<b>(k)</b> $t(x) = \frac{x^2-1}{ x-2 }$	<b>(l)</b> $u(x) = \sqrt{4 - x^2}$

2. Calculate  $g \circ f$  and  $f \circ g$  for the following  $f, g$ :

<b>(a)</b> $f(x) = 2x + 3,$ $g(x) =  x - 1 $	<b>(b)</b> $f(x) = \sqrt{ x },$ $g(x) = 3x - 5$	<b>(c)</b> $f(x) = x^2 + 2x + 1,$ $g(x) = \frac{1}{ x }$
<b>(d)</b> $f(x) = \frac{1}{ x },$ $g(x) = x^3 - 2$	<b>(e)</b> $f(x) = 2 x  - 1,$ $g(x) = x + 4$	<b>(f)</b> $f(x) = (x - 2)^2,$ $g(x) =  x  + 2$
<b>(g)</b> $f(x) = \frac{1}{ x +1},$ $g(x) = x^2 - 4$	<b>(h)</b> $f(x) = x + 1,$ $g(x) =  x^2 - 2x $	<b>(i)</b> $f(x) = x^2 - 1,$ $g(x) =  x - 3 $

3. Determine whether the following functions to  $\mathbb{R}$  are injective, surjective or bijective.

<b>(a)</b> $f(x) = 2x + 1$	<b>(b)</b> $g(x) = x^2 - 3$	<b>(c)</b> $h(x) = \frac{1}{x}$
<b>(d)</b> $k(x) =  x  + 2$	<b>(e)</b> $m(x) = \sqrt{x}$	<b>(f)</b> $n(x) = \frac{x^2-1}{x+1}$
<b>(g)</b> $p(x) = \sqrt{ x }$	<b>(h)</b> $q(x) = \frac{ x }{x+1}$	<b>(i)</b> $r(x) = 3x^2 - 1$

4. Find an inverse for the following functions. Be careful! Some of this functions are not injective, so determine a maximal domain where the inverse is defined:

<b>(a)</b> $f(x) = 3x - 2$	<b>(b)</b> $g(x) = \frac{x+1}{2}$	<b>(c)</b> $h(x) = x^2 + 4$
<b>(d)</b> $k(x) = \sqrt{x - 3}$	<b>(e)</b> $m(x) = \frac{2x-1}{x+3}$	<b>(f)</b> $n(x) = x^4 + 5$ when $x \leq 0$