

## Functions. Introduction.

1. Determine if the given relation is a function or not.

a)  $\{(1, 2)(3, 1)(4, 2)(3, 4)\}$

b)  $y = x^2 - 1$

c)  $y^2 = x - 1$

d)  $y = x^3(x^2 - 1)$

e)  $y = x^2(x^3 - 1)$

2. Find the domain and range of the following functions:

a)  $y = x^3 - 2$

b)  $y = x^4 + 2$

c)  $y = \sqrt{x - 2}$

d)  $y = 1 - \sqrt{x - 2}$

e)  $y = \frac{3}{2x-4}$

3. Find the domain of:

a)  $y = x^2 + 5x - 3$

b)  $y = \frac{x-2}{x^2-9}$

c)  $y = \frac{\sqrt{x-2}}{x^2-9}$

d)  $y = \sqrt{5-x} + \sqrt[4]{x-1}$

e)  $y = \sqrt{5-x} + \sqrt[3]{x-1}$

4. Find the composite functions  $(f \circ g)(x)$  and  $(g \circ f)(x)$  if:

a)  $f(x) = \sqrt{x+2}$  and  $g(x) = \frac{3}{2x}$ .

b)  $f(x) = \sqrt{x} + 2$  and  $g(x) = x^2 - 1$ .

c)  $f(x) = \sqrt{x+2}$  and  $g(x) = (x-1)^2$ .

### Solutions

1. a) It is not a function.      b) It is a function.      c) It is not a function.      d) It is a function.  
e) It is a function.

2. a) Domain: all real numbers, range: all real numbers.      b) Domain: all real numbers, range:  $y \geq 2$   
c) Domain:  $x \geq 2$ , range:  $y \geq 0$       d) Domain:  $x \geq 2$ , range:  $y \leq 1$   
e) Domain:  $x \neq 2$ , range:  $y \neq 0$

3. a) All real numbers.      b)  $\{x \mid x \neq 3 \text{ or } x \neq -3\}$       c)  $\{x \mid x \geq 2 \text{ or } x \neq 3\}$   
d)  $\{x \mid 1 \leq x \leq 5\}$       e)  $\{x \mid x \leq 5\}$

4. a)  $(f \circ g)(x) = \sqrt{\frac{3}{2x} + 2}$ ,  $(g \circ f)(x) = \frac{3}{2\sqrt{x+2}}$ .

b)  $(f \circ g)(x) = \sqrt{x^2 - 1} + 2$ ,  $(g \circ f)(x) = (\sqrt{x} + 2)^2 - 1 = x + 4\sqrt{x} + 3$ .

c)  $(f \circ g)(x) = \sqrt{(x-1)^2 + 2} = \sqrt{x^2 - 2x + 3}$ ,  $(g \circ f)(x) = (\sqrt{x+2} - 1)^2 = x + 3 - 2\sqrt{x+2}$ .