

1. Take $X = \{1, 3, 4\}$ and $Y = \{0, 1\}$. Write down all elements of $X \times Y$.

$$X \times Y = \{ (1, 0), (1, 1), (3, 0), (3, 1), (4, 0), (4, 1) \}$$

2. Take \mathbb{R} to be the set of real numbers. Denote by Y and r the sets

$$Y = \{-1, 2, 3\} \quad \text{and} \quad r = \{(1.5, -1), (\pi, 2), (-100, -1)\}$$

where r is a subset of $\mathbb{R} \times Y$. State the natural domain, co-domain, domain, and range of r .

natural domain \mathbb{R}
 domain $\{1.5, \pi, -100\}$
 co-domain $\{-1, 2, 3\}$ or Y
 range $\{-1, 2\}$

3. Take $X = \{1, 3, 4\}$ and $Y = \{0, 1\}$. Define a function from X to Y .

Many examples possible. Here is one:

$$f = \{ (1, 0), (3, 1), (4, 0) \} \quad \text{or} \quad f(1)=0, f(3)=1, f(4)=0$$

4. Take $X = \{1, 3, 4\}$ and $Y = \{0, 1\}$. Define a relation X to Y that is not a function.

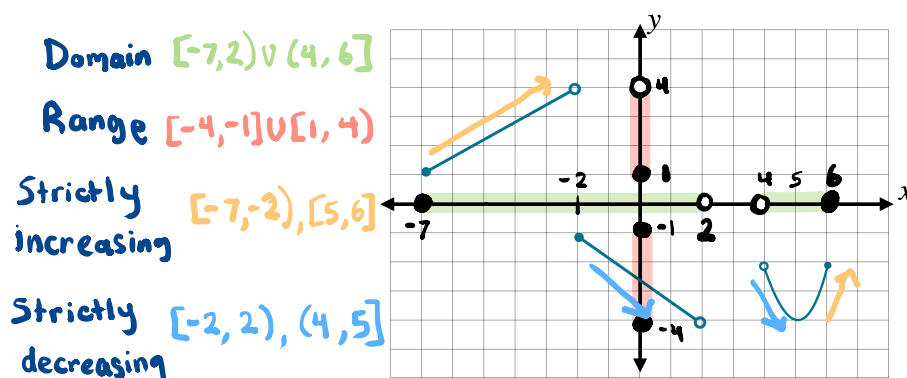
Many examples possible. Here is one:

$$r = \{ (1, 0), (3, 0), (3, 1) \}$$

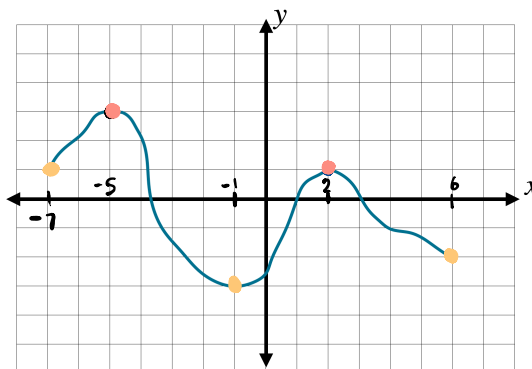


the number 3 in domain
is associated to more than one element in range

5. Take f to be a function whose graph is given below. Find the domain and range of the function and find the largest intervals on which the function is strictly increasing and strictly decreasing.



6. Find all the extremal values of the function below in the interval $[-7, 6]$.



global max -5
local max -5, 2
global min -1
local min -7, -1, 6