

EASTERN UNIVERSITY  
Practice Sheet #1  
Function, Domain & Range

Find out the domain and range of the following functions and also sketch the graph:

1. $f(x) = \frac{1}{x-3}$	11. $f(x) = \frac{2x}{x-4}$
2. $f(x) = \sqrt{x^2-9}$	12. $f(x) = \frac{1}{5x+7}$
3. $f(x) = \sqrt{9-x^2}$	13. $f(x) = \ln(x^2+1)$
4. $f(x) = \sqrt{x^2-5x+6}$	14. $f(x) = \begin{cases} x^2 & , x < 0 \\ x & , 0 \leq x \leq 1 \\ \frac{1}{x} & , x > 1 \end{cases}$
5. $f(x) = \frac{x}{ x }$	15. $f(x) = \begin{cases} 2x+6 & , -3 \leq x \leq 0 \\ 6 & , 0 < x < 2 \\ 2x-6 & , 2 \leq x \leq 5 \end{cases}$
6. $f(x) = x^3 + 2$	16. $f(x) = \sin^2 x$
7. $f(x) = \begin{cases} x+2 & , x \leq 1 \\ x^3 & ,  x  < 1 \\ -x+3 & , x \geq 1 \end{cases}$	17. $f(x) = e^x$
8. $f(x) = \begin{cases} \frac{x^2-1}{x-1} & , x \neq 1 \\ 2 & , x = 1 \end{cases}$	18. $f(x) = \text{Log} x$
9. $f(x) = 3\sin x$	19. $f(x) = \sqrt{2x+4}$
10. $f(x) = -\sqrt{x^2-7x+10}$	

## Domain & Range

Solutions of the problems:

$$01. f(x) = \frac{1}{x-3}$$

The domain of  $f = \mathbb{R} - \{3\}$

The range of  $f = \mathbb{R} - \{0\}$

$$02. f(x) = \sqrt{x^2 - 9}$$

The domain of  $f = (-\infty, -3] \cup [3, +\infty)$

The range of  $f = [0, +\infty)$

$$03. f(x) = \sqrt{9 - x^2}$$

The domain of  $f = [-3, 3]$

The range of  $f = [0, 3]$

$$04. f(x) = \sqrt{x^2 - 5x + 6}$$

The domain of  $f = (-\infty, 2] \cup [3, \infty)$

The range of  $f = [0, +\infty)$

$$5. f(x) = \frac{x}{|x|}$$

The domain of  $f = \mathbb{R} - \{0\}$

The range of  $f = [-1, 0) \cup (0, 1]$

$$6. f(x) = x^3 + 2$$

$f(x)$  is a polynomial

$\therefore$  The domain of  $f = (-d, +d)$

The range of  $f = (-d, +d)$

$$7. f(x) = \begin{cases} x+2, & x \leq -1 \\ x^3, & |x| < 1 \\ -x+3, & x \geq 1 \end{cases}$$

dom.  $f = (-d, -1] \cup (-1, 1) \cup [1, +d)$

$= (-d, +d)$

The range of  $f = (-d, 1] \cup (-1, 1) \cup (-d, 2]$

$$8. f(x) = \begin{cases} \frac{x^2-1}{x-1}, & x \neq 1 \\ 2, & x = 1 \end{cases}$$

$$= \begin{cases} x+1, & x \neq 1 \\ 2, & x = 1 \end{cases}$$

$$\text{The domain of } f = (-\infty, 1) \cup (1, +\infty) \cup \{1\} \\ = (-\infty, +\infty)$$

$$\text{Range of } f = (-\infty, 2) \cup (2, +\infty) \cup \{2\} \\ = (-\infty, +\infty)$$

$$9. f(x) = 3 \sin x$$

$$\text{The domain of } f = (-\infty, +\infty)$$

$$\text{Range of } f = [-3, 3]$$

$$10. f(x) = -\sqrt{x^2 - 7x + 10} \quad \text{dom } f = \mathbb{R} - (2, 5)$$

The domain of the  $f = (-\infty, 2] \cup [5, +\infty)$

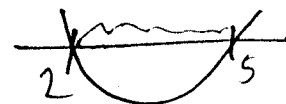
$$\text{Range of } f = (-\infty, 0]$$

$$\begin{aligned} x^2 - 7x + 10 & \geq 0 \\ (x-2)(x-5) & \geq 0 \\ \Rightarrow x & \leq 2 \text{ or } x \geq 5 \\ & \text{not consider} \end{aligned}$$

$$11. f(x) = \frac{2x}{x-4}$$

Domain of  $f, f = (-\infty, 4) \cup (4, +\infty)$

$$\text{Range} = (-\infty, 2) \cup (2, +\infty)$$



$$y = \frac{2x}{x-4}$$

$$\Rightarrow x = \frac{4y}{y-2}$$

$$12. f(x) = \frac{1}{5x+7}$$

The Domain of  $f = (-\infty, -7/5) \cup (-7/5, +\infty)$

$$\text{Range of } f = (-\infty, 0) \cup (0, +\infty)$$

$$13. f(x) = \ln(x^2 + 1)$$

The function is valid for,

$$\begin{aligned} x^2 + 1 & > 0 \\ \Rightarrow x^2 & > -1 \\ \therefore x & > \sqrt{-1} \end{aligned}$$

cancel

Since, it is a complex number.  
 It has no domain and range.

14.  $\text{Dom } f = (-\infty, \infty)$   
 $\text{Range } f = [0, \infty)$

$$f(x) = \begin{cases} x^2, & x < 0 \\ x, & 0 \leq x \leq 1 \\ \frac{1}{x}, & x > 1 \end{cases}$$

The domain of,  $F = (-\infty, 0) \cup [0, 1] \cup (1, +\infty)$   
 $= (-\infty, +\infty)$

Range =  $(0, +\infty) \cup [0, 1] \cup (0, 1)$   
 $= [0, +\infty)$

15.  $f(x) = \begin{cases} 2x+6, & -3 \leq x \leq 0 \\ 6, & 0 < x < 2 \\ 2x-6, & 2 \leq x \leq 5 \end{cases}$

Domain =  $[-3, 0] \cup (0, 2) \cup [2, 5]$   
 $= [-3, 5]$

$$\begin{aligned}\text{Range} &= [0, 6] \cup \{6\} \cup [-2, 4] \\ &= [-2, 6]\end{aligned}$$

$$16. f(x) = \sin^2 x$$

$$\text{Domain} = (-\infty, +\infty)$$

$$\text{Range} = [0, 1]$$

$$17. f(x) = e^x$$

$$\text{Domain} = (-\infty, +\infty)$$

$$\text{Range} = (0, +\infty)$$

$$18. f(x) = \log x$$

$$\text{Domain} = (0, \infty)$$

$$\text{Range} = (-\infty, +\infty)$$

$$19. f(x) = \sqrt{2x+4}$$

$$\text{Domain} = [-2, +\infty)$$

$$\text{Range} = [0, +\infty)$$



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