2.1: Functions and Domain and Range

1. If $h \neq 0$ and $f(x) = x^2 - 1$, then $\frac{f(x+h)-f(x)}{h} =$

   A) $2x + h$

   B) $2x + h + 1$

   C) $2x - h - 1$

   D) $2x - h$

   E) $h - 2$

2. The domain D and the range R of the function $f(x) = 2 - \sqrt{6 - 3x}$ are respectively given by

   A) $D = (-\infty, 2]$ and $R = (-\infty, 2]$

   B) $D = (-\infty, 2]$ and $R = [2, \infty)$

   C) $D = (-\infty, 2]$ and $R = [2,6]$

   D) $D = [2, \infty)$ and $R = [2, \infty)$

   E) $D = [2, \infty)$ and $R = (-\infty, 2]$

3. If $f(x) = x^3 - 1$ and $h \neq 0$, then $\frac{f(2+h)-f(2)}{h} =$

A) $h^2 + 6h + 12$

B) $h^2 + 6h + 14$

C) h^2

D) $h^2 - \frac{2}{h}$

E) $h^2 + 6h$

4. The domain of $y = \frac{1}{\sqrt{x}-3}$ in interval notation is:

A) $[0,9) \cup (9, \infty)$

B) $(-\infty, 9) \cup (9, \infty)$

C) $[0, \infty)$

D) $(3, \infty)$

E) $(9, \infty)$

5. The domain D and the range R of the function $f(x) = \frac{\sqrt{4-9x^2}}{2}$ is given by

A) $D = [-2/3,2/3]; R = [0,1]$

B) $D = [-2/3,2/3]; R = (-\infty, 0]$

C) $D = [-2/3,2/3]; R = [0, \infty)$

D) $D = (-\infty, -2/3]; R = [0, \infty)$

E) $D = [2/3, \infty); R = [0,1)$

6. If $f(x) = \frac{2}{3}x + 2$, then $f(x-3) =$

A) $f(x) - 2$

B) $f(x) + 2$

C) $f(x) - 3$

D) $f(x) + 3$

E) $f(x) + 2/3$

7. If (a, b) is the intersection point of the graphs of $f_1(x) = -3x - 7$ and $f_2(x) = 2x + 13$, then $a + b =$

A) 1

B) -2

C) 4

D) -3

E) 3

8. If $g(x) = 5x^2 - 4x$, then the expression $\frac{g(x+h)-g(x)}{h}$ simplifies to

A) $10x + 5h - 4$

B) $10x + 5h + 4$

C) $10x - 5h + 4$

D) $5x + 5h + 4$

E) $5x - 5h - 4$

9. The domain, in interval notation, of the function $f(x) = \frac{\sqrt{x-2}}{x^2-3x}$ is equal to

A) $[2,3) \cup (3,\infty)$

10. Which one of the following statements is FALSE ?

A) The domain of the function $f(x) = -5$ is $\{-5\}$

B) The range of the relation $x = -7$ is $(-\infty, \infty)$

C) The domain and range of the function $6x - 7y = 0$ are both $(-\infty, \infty)$

D) The slope of a vertical line is undefined

E) The graph of a constant function is a horizontal line

11.If $f(x) = \sqrt{7-3x}$, then the Domain D and the Range R, are:

A) D is $\left(-\infty, \frac{7}{3}\right]$ and R is $[0, \infty)$

12. If D is the Domain of $y = \frac{5}{x-9}$ and R is the Range of $y = \sqrt{x-1}$

then:

A) $\mathrm{D} = (-\infty, 9) \cup (9, \infty)$ and $\mathrm{R} = [0, \infty)$

13.If D is the Domain of $y = \frac{1}{\sqrt{x-3}}$ and R is the Range of $y = x^2$ then:

A) $\mathrm{D} = (3, \infty)$ and $\mathrm{R} = [0, \infty)$

14.The domain of the function $y = \sqrt{\frac{x^2-3x}{2-x}}$ is

A) $(-\infty, 0] \cup (2,3]$

15.The domain of the function $y = \frac{3}{\sqrt{x}-2}$ is

A) $[0,4) \cup (4, \infty)$

16.The domain of $g(x) = \sqrt{x - x^3}$ is

A) $(-\infty, -1] \cup [0,1]$

17.If $f(x) = \frac{1}{x+1}$, then $\frac{f(1+h)-f(1)}{h}$ is equal to

A) $-\frac{2}{h}$

B) $-\frac{3}{2(2+h)}$

C) $-\frac{1}{2(2+h)}$

D) $-\frac{2}{2+h}$

E) $-2(2+h)$

18.If $f(x) = \sqrt{x}$, then $\frac{f(1+h)-f(1)}{h}$ is equal to

A) $-\frac{1}{1+\sqrt{1+h}}$

B) $\frac{1}{h}$

C) $\frac{1}{\sqrt{1+h-1}}$

D) $\frac{1}{1+\sqrt{1+h}}$

E) $-\frac{1}{h}$

19.Let $h \neq 0$. If $f(x) = x^2 + 5$, then $\frac{f(x)-f(x-h)}{h} =$

A) $2x - h$

B) $2x + h$

C) $2x$

D) $-2x + h$

E) $2x^2 - h$

20.If the domain, in interval notation, of $f(x) = \sqrt{|x-2| - 1}$ is given by $(-\infty, a] \cup [b, \infty)$, then $a + b =$

A) 4

B) 1

C) 5

D) 3

E) -1

21. If $f(x) = x^2 - 2x + 3$ and $h \neq 0$, then $\frac{f(x+h)-f(x)}{h} =$

A) $2x - h + 2$

B) $2x + h + 2$

C) $x + h - 2$

D) $2x - h - 2$

E) $2x + h - 2$

22. The domain of the function $f(x) = \frac{x-3}{x^3-x^2-9x+9}$ is

A) $(-\infty, -3) \cup (-3,3) \cup (3, \infty)$

B) $(-\infty, \infty)$

C) $(-\infty, -3) \cup (-3,1) \cup (1,3) \cup (3, \infty)$

23.If $f(x) = \frac{1}{x+1}$, then the difference quotient $\frac{f(1)-f(h+1)}{h} =$

A) $\frac{1}{2(h+2)}$

B) $\frac{-1}{2(h+2)}$

C) $\frac{h}{h+2}$

D) $\frac{-1}{h+2}$

E) $\frac{h}{2h+2}$

24. If $f(x) = \begin{cases} 4x^2 & \text{if } x \le 0 \\ 2x+1 & \text{if } 0 < x < 2 \\ |x-2| & \text{if } x \ge 2 \end{cases}$ then $f(-1) + f(1) + f(5)$

A) 10

25. The relation $y^2 - 1 = x$ is a function if

A) y < 0

B) x < 0

C) x > 0

D) x > - 1

E) y > - 1