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. Identify the set of ordered pairs (x, y) or relation that defines y as a function of x

A) $5y + x = 2y + \sqrt{x^2 - 5}$

B) $(x-1)^2 + (y-2)^2 = 25$

C) $\{(1/2,0), (2,-1), (3,3), (1/2,1/4)\}$

D) $|5y - 1| = 2x + 5$

E) $-4x^2 + y^2 = 9$

5. 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) $(9, \infty)$

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

7. 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) $f(x) + 2/3$

8. 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

9. 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) $5x - 5h - 4$

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

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

11. 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

12.Which one of the following relations DOSE NOT represent a function:

A) $y^2 = 3x + 6$

B) $x + 5y = 7$

C) $y = x^2 - 4$

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

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

13.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 $[0, \infty)$

14.Which one of the following relations defines y as a function of x ?

A) $y = \sqrt{2x + 1}$

B) $x = y^4$

C) $\{(1,10), (2,15), (3,19), (2,19), (5,27)\}$

D) $x^2 + y^2 = 4$

E) $x = 5$

15. 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 $\mathrm{R} = [0, \infty)$

16.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 $\mathrm{R} = [0, \infty)$

17.Which one of the following relations defines y as a function of x ?

A) $y^3 + 3x = 1$

B) $x^2 + 4y^2 = 1$

C) $x = |y + 2|$

D) $y = \pm\sqrt{x - 3}$

E) $\{(x, y) \mid x = 2\}$

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

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

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

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

20. Which one of the following equations or the set of ordered pairs defines y. as a function of x ?

A) $|5y - 1| = 3x$

B) $xy - y = 7$

C) $x + 2 = y^4$

D) $\{(x, y): x = 1\}$

E) $\{(-2,4), (0,6), (2,5), (0,8)\}$

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

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

22.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) $-2(2+h)$

23.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) $-\frac{1}{h}$

24.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) $2x^2 - h$

25. Which ONE of the following equations defines y as a function of x ?

A) $|x| + y = 5$

B) $x^3 + y^2 = 1$

C) $\sqrt{y^2} - x = 5$

D) $y = 3 \pm \sqrt{x - 1}$

E) $x^2 + (y - 1)^2 = 4$

26. 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

27. 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) $2x + h - 2$

28. Which ONE of the following does NOT represent y as a function of x?

A) $y = 1$

B) $x^2 + (y-1)^3 = 4$

C) $2y + |x| = 0$

D) $x^2 - \sqrt[3]{y} = 0$

E) $x + 2|y| = 0$

29. 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) $(-\infty,-3) \cup (-3,1) \cup (1,3) \cup (3,\infty)$

30.Which ONE of the following relations defines y as a function of x ?

A) $x^2 + \sqrt[3]{y} + 1 = 0$

31. Which one of the following equations DOES NOT represent y as a function of x ?

A) $x^2 - |y| = 4$

B) $x^2 - 2y = 8$

C) $2x - y = -6$

D) $|x| - 3y = 4$

E) $x^4 - y^3 = 3$

32. Which one of the following does NOT define y as a function of x ?

A) $4x = \sqrt{y^2}$

B) $xy = 5$

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

D) $|x| - y = 3$

E) $\{(2,5), (3,3), (4,4), (5,2)\}$

33.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) $\frac{h}{2h+2}$

34.If $f(x) = \begin{cases} -|-x| & \text{if} \quad x < 0 \\ -2 & \text{if} \quad 0 \leq x < 4 \\ [\,[x-4]\,] & \text{if} \quad x \geq 4 \end{cases}$, where [[]] is the greatest integer function, then $f(-2) + f(0) + f(2\pi) =$

A) -2

B) -6

C) 2

D) -1

E) 6

35.If $f(x) = \begin{cases} \sqrt{(1-5x)^2}, & \text{if } x < 2 \\ [\,[2x+1]\,], & \text{if } x \geq 2 \end{cases}$, then $f(\pi) + f(1) =$

A)11

B) 7

C) -4

D) $5\pi + 2$

E) $2\pi + 5$

36.If $f(x) = \begin{cases} -x^2 + 6 & \text{if } x < -3 \\ |2 + 5x| & \text{if } -3 \leq x < 1 \\ [\,[3x - 4]\,] & \text{if } x \geq 1 \end{cases}$, where [[]] denotes the greatest integer function, then $f(\pi) - f(-2) =$

A) -3

B) 13

C) 0

D) 7

E) -7

37. The function $f(x) = \begin{cases} \frac{|x|}{x} & \text{if} \quad x < 0 \\ 4 - x^2 & \text{if} \quad x \geq 0 \end{cases}$ and $k < 0$, then $f(k) - (1/5)f(3) =$

A) 0

B) -2

C) -6

D) 2

E) 6

38.If $f(x) = \begin{cases} [\,[3 - 2x]\,] & \text{if} \quad 0 \leq x < 3 \\ |4x - 1| & \text{if} \quad -3 \leq x < 0 \\ -2 & \text{if} \quad x < -3 \end{cases}$, then $f(11/4) + f(-2) + f(-5) =$

A) 4

B) -1

C) -20

D) -15

E) 5

39.The set of all values of x for which $[\,[\frac{1}{2}x+1]\,]=-3$, where $[\,[\cdot]\,]$ denotes the greatest integer function, is in the interval

A) $[-8,-6)$

B) $[-4,-3)$

C) $[-7,-5)$

D) $[-3,0)$

E) $[6,8)$

40.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

41. Given $f(x) = \begin{cases} 2x+1 & \text{if } x < 2 \\ [2x+1] & \text{if } x \geq 2 \end{cases}$, where [is the greatest integer function, then $f(-4) + f\left(\frac{7}{3}\right)$ is equal to

A) -2

B) $\frac{20}{3}$

C) -3

D) -9

E) $-\frac{4}{3}$

42.Given $f(x) = \begin{cases} \sqrt{(1-5x)^2} & \text{if } x < 2 \\ [2x+1] & \text{if } x \geq 2 \end{cases}$,

where [ ] is the greatest integer function, then $f(\pi) + f(1)$ is equal to

A) 11

B) $5\pi + 2$

C) -4

D) 7

E) $2\pi + 5$

43. For the function $f(x) = \begin{cases} [\,[x-1]\,] & \text{if} \quad x > 0 \\ |2x-5| & \text{if} \quad x \leq 0 \end{cases}$, where [[ ]] is the greatest integer function, then $f(\pi) - f(-1/2) =$

A) -4

B) 3

C) -2

D) 4

E) -3