Functions

1. Let $f(x) = \max(2x + 1, 3 - 4x)$, where x is any real number. Then the minimum possible value of f (x) is:

(a) 1/3 (b) 1/2 (c) 2/3 (d) 5/3

2. Let $f(x) = ax^2 - b|x|$, where a and b are constants. Then, at x = 0, f(x) is:

(a) maximized whenever $a > 0, b > 0$

(b) maximized whenever $a > 0, b < 0$

(c) minimized whenever $a > 0, b > 0$

(d) minimized whenever $a > 0, b < 0$

3. For the function $f(x) = 2x - 1$, $g(x) = 5 - x$, and $h(x) = x^2 + x + 1$, find range of x for which $\min\{f(x^2), h(x)\} < 3$.

(a) $-2 < x < \sqrt{2}$ (b) $-\sqrt{2} < x < \sqrt{2}$

(c) $-2 < x < 2$ (d) $-\sqrt{2} < x < 2$

4. The function $f(x) = |x - 2| + |2.5 - x| + |3.6 - x|$, where x is a real number, attains a minimum at:

(a) $x = 2.3$ (b) $x = 2.5$

(c) $x = 2.7$ (d) None of these

5. Find the minimum value of $f(x) = |3x - 2| + |2x - 3|$.

(a) 5/6 (b) 5/3

(c) 5/2 (d) None of these

6. Find the minimum value of $f(x) = \max(k - x, |x| + k)$.

(a) $k - 1$ (b) k

(c) $2k$ (d) None of these

7. Let $f(x) = ax^2 + bx + c$, where a, b and c are certain constants and $a \neq 0$. it is know that $f(5) = -3f(2)$ and that 3 is the root of $f(x) = 0$. What is the other root of $f(x) = 0$?

(a) -7 (b) -4

(c) 2 (d) Cannot be determined

8. If $f(x) = x^3 - 4x + p$, and if f(0) and f(1) are of opposite sign, then which of the following is necessarily true?

(a) $-1 < p < 2$ (b) $0 < p < 3$

(c) $-2 < p < 1$ (d) $-3 < p < 0$

9. The domain of $y = \frac{1}{\sqrt{|x| - x}}$ is

(a) $(0, \infty)$

(b) (∞, ∞)

(c) $(-\infty, 0)$

(d) $(1, \infty)$

10. If $f(x) = \log\left(\frac{1+x}{1-x}\right)$, then

(a) f(x) is even

(b) $f(x_1).f(x_2) = f(x_1 + x_2)$

(c) $\frac{f(x_1)}{f(x_2)} = f(x_1 - x_2)$

(d) f(x) is odd

11. What is the minimum and maximum value of $\frac{2x}{x^2+1}$ respectively?

(a) – 1, 1

(b) – 2, 1

(c) – $\frac{1}{3}$, 0

(d) None of these

12. Let f(x) = max (2x + 1, 3 – 4x), where x is any real number. Then, the minimum possible value of f(x) is:

(a) $\frac{1}{3}$

(b) $\frac{1}{2}$

(c) $\frac{2}{3}$

(d) $\frac{5}{3}$

13. Minimum value of $f(x) = |3 - x| + |2 + x| + |5 - x|$, will be:

(a) 0 (b) 7

(c) 8 (d) 10

14. A function f(x) is defined as follows:

(i) $f(1) = 1$

(ii) $f(2x) = 4\, f(x) + 6$

(iii) $f(x + 2) = f(x) + 12x + 12$

then calculate f(6).

(a) 106 (b) 96

(c) 86 (d) 76

15. Let $f(x) = |x - 2| + |2.5 - x| + |3.6 - x|$, where x is a real number, attains a minimum at

(a) $x = 2.3$ (b) $x = 2.5$

(c) $x = 2.7$ (d) None of these

16. Find for what value of a is: $f(n) = (a - 2)n + 3a - 4$ an even function?

(a) -2 (b) 2

(c) 3 (d) 4

17. Let $g(x) = \max(5 - x, x + 2)$. The smallest possible value of $g(x)$ is ?

(a) 4.0 (b) 4.5

(c) 1.5 (d) None of these

18. Find the maximum value of the functions $1/(x^2 - 3x + 2)$?

(a) 11/4 (b) 1/4

(c) 0 (d) None of these

19. Let g(x) be a function such that $g(x + 1) + g(x - 1) = g(x)$ for every real x. Then, for what value of p is the relation $g(x + p) = g(x)$ necessarily true for every real x ?

(a) 5 (b) 3

(c) 2 (d) 6

20. A function f(x) satisfies $f(1)=3600$ and $f(1) + f(2) + \ldots\ldots f(n) = n^2 f(n)$, for all positive integers $n>1$. What is the value of f(9) ?

(a) 200 (b) 100

(c) 120 (d) 80