

Questions Bank
Mathematics Part II
Chapter 1

A. MCQs.

1. $2 \sinh x =$

a. $e^x + e^{-x}$

c. $\frac{e^x + e^{-x}}{2}$

b. $e^x - e^{-x}$

d. $\frac{e^x - e^{-x}}{2}$

2. $2 \cosh x =$

a. $e^x - e^{-x}$

c. $\frac{e^x - e^{-x}}{2}$

b. $e^x + e^{-x}$

d. $\frac{e^x + e^{-x}}{2}$

3. $\frac{1}{2} \operatorname{sech} x =$

a. $\frac{1}{e^x + e^{-x}}$

c. $\frac{1}{e^x - e^{-x}}$

b. $\frac{1}{e^x - e^{-x}}$

d. $\frac{1}{e^x + e^{-x}}$

4. If a vertical line meets the curve at more than 1 points, then the curve represents

a. 1 – 1 function

c. Into function

b. Not a function

d. Onto function

5. The volume “V” of a sphere as a function of its radius “r” is given by:

a. $\frac{4}{3} \pi r^2$

c. $\frac{2}{3} \pi r^2$

b. $\frac{4}{3} \pi r^3$

d. $\frac{2}{3} \pi r^3$

6. The domain of $y = \cot x$ is:

a. $\left\{x: x \in R \text{ and } x \neq (2n + 1)\frac{\pi}{2}, n \text{ an integer} \right\}$

b. $\left\{x: x \in R \text{ and } x \neq n\frac{\pi}{2}, n \text{ an integer} \right\}$

c. $\left\{x: x \in R \text{ and } x \neq n\pi, n \text{ an integer} \right\}$

d. None of the above

7. The domain of $y = \tan x$ is:

a. $\left\{x: x \in R \text{ and } x \neq (2n + 1)\frac{\pi}{2}, n \text{ an integer} \right\}$

b. $\left\{x: x \in R \text{ and } x \neq n\frac{\pi}{2}, n \text{ an integer} \right\}$

c. $\left\{x: x \in R \text{ and } x \neq n\pi, n \text{ an integer} \right\}$

d. None of the above

8. The domain of $y = \sec x$ is:

- a. $\left\{x: x \in R \text{ and } x \neq (2n + 1)\frac{\pi}{2}, n \text{ an integer} \right\}$
- b. $\left\{x: x \in R \text{ and } x \neq n\frac{\pi}{2}, n \text{ an integer} \right\}$
- c. $\left\{x: x \in R \text{ and } x \neq n\pi, n \text{ an integer} \right\}$
- d. None of the above

9. The domain of $y = \csc x$ is:

- a. $\left\{x: x \in R \text{ and } x \neq (2n + 1)\frac{\pi}{2}, n \text{ an integer} \right\}$
- b. $\left\{x: x \in R \text{ and } x \neq n\frac{\pi}{2}, n \text{ an integer} \right\}$
- c. $\left\{x: x \in R \text{ and } x \neq n\pi, n \text{ an integer} \right\}$
- d. None of the above

10. $\sinh^{-1} x =$

- a. $\ln(x + \sqrt{x^2 + 1})$
- b. $\ln(x + \sqrt{x^2 - 1})$
- c. $\ln\left(\frac{x+1}{x-1}\right)$
- d. None of these

11. $\cosh^{-1} x =$

- a. $\ln(x + \sqrt{x^2 - 1})$
- b. $\ln(x + \sqrt{x^2 + 1})$
- c. $\frac{1}{2}\ln\left(\frac{x+1}{x-1}\right)$
- d. None of these

12. $\tanh^{-1} x =$

- a. $\ln(x + \sqrt{x^2 - 1})$
- b. $\frac{1}{2}\ln\left(\frac{1+x}{1-x}\right)$
- c. $\frac{1}{2}\ln\left(\frac{x+1}{x-1}\right)$
- d. None of these

13. $\coth^{-1} x =$

- a. $\ln(x + \sqrt{x^2 - 1})$
- b. $\frac{1}{2}\ln\left(\frac{1+x}{1-x}\right)$
- c. $\frac{1}{2}\ln\left(\frac{x+1}{x-1}\right)$
- d. None of these

14. $\operatorname{sech}^{-1} x =$

- a. $\ln(x + \sqrt{x^2 - 1})$
- b. $\ln\left(\frac{1}{x} + \frac{\sqrt{1-x^2}}{x}\right)$
- c. $\frac{1}{2}\ln\left(\frac{x+1}{x-1}\right)$
- d. None of these

15. $\operatorname{csch}^{-1} x =$

- a. $\ln(x + \sqrt{x^2 - 1})$
- b. $\ln\left(\frac{1}{x} + \frac{\sqrt{x^2+1}}{|x|}\right)$
- c. $\frac{1}{2}\ln\left(\frac{x+1}{x-1}\right)$
- d. None of these

16. $\lim_{x \rightarrow 2} \frac{x^5 - 32}{x - 2}$

- a. 40
- b. 160
- c. 80
- d. 120

$$17. \lim_{n \rightarrow \infty} \left(1 + \frac{5}{n}\right)^n$$

- a. $e^{\frac{1}{5}}$
c. e^{10}

- b. e^5
d. $e^{\frac{1}{10}}$

$$18. \lim_{x \rightarrow 2} (\sqrt{x^3 + 1} - \sqrt{x^2 + 5})$$

- a. 1
c. 2

- b. 0
d. 3

$$19. \lim_{x \rightarrow 0} \frac{\sin x}{x}$$

- a. $\frac{\pi}{2}$
c. $\frac{180}{\pi}$

- b. $\frac{\pi}{180}$
d. 1

20. The domain of $f(x) = \frac{x^3 - 8}{x - 2}$ is:

- a. R
c. $[0, 2]$

- b. $R - \{2\}$
d. None of these

$$21. \lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} =$$

- a. na^{n-1}
c. na^{n-2}

- b. na
d. 0

22. The function $f(x)$ is continuous at $x = a$ if

- a. $\lim_{x \rightarrow a^-} f(x)$ exists
c. $\lim_{x \rightarrow a} f(x) = f(a)$

- b. $\lim_{x \rightarrow a^+} f(x)$ exists
d. None of these

23. The parametric equations of the circle $x^2 + y^2 = a^2$ are:

- a. $x = a \cos t, y = a \sin t$
c. $x = a \sinh t, y = a \cosh t$

- b. $x = a \sin t, y = a \cos t$
d. $x = a \cosh t, y = a \sinh t$

$$24. \lim_{x \rightarrow 0} \frac{\sin 7x}{x} =$$

- a. 1
c. $1/7$

- b. 7
d. None of these

25. The function $f(x) = \cos x$ is:

- a. Even
c. Neither even nor odd

- b. Odd
d. None of the above

26. Which of the following is an odd function.

a. $f(x) = x^2 + x$

c. $f(x) = x^2\sqrt{x^2 + 5}$

b. $f(x) = \frac{x^3 - x}{x^2 - 1}$

d. $f(x) = x^{2/3} + 6$

27. Which of the following is an even function.

a. $f(x) = x^3 + x$

c. $f(x) = x^{2/3} + 6$

b. $f(x) = \frac{x^3 - x}{x^2 - 1}$

d. None of these

28. If $f(x) = \sqrt{x + 2}$ then range of f^{-1} is

a. R

c. $(-\infty, 2]$

b. $[-2, \infty)$

d. $R - \{0\}$

29. $\cosh^2 x - \sinh^2 x =$

a. 1

c. -1

b. 0

d. 2

30. $\lim_{h \rightarrow 0} \frac{\sqrt{x+h} - \sqrt{x}}{h} =$

a. $\frac{1}{2\sqrt{h}}$

c. $\frac{-1}{2\sqrt{x}}$

b. $\frac{1}{2\sqrt{x}}$

d. $\frac{-1}{2\sqrt{h}}$

B. Short Questions.

1. Define function with examples.

2. What is polynomial function?

3. Describe parametric function with example.

4. Define odd function?

5. What is an even function?

6. Define left hand limit.

7. Define right hand limit.

8. Define rational function with example.

9. Define explicit function.

10. Prove that $\lim_{x \rightarrow 0} \frac{\sqrt{x+a} - \sqrt{a}}{x} = \frac{1}{2\sqrt{a}}$

11. Define implicit function.

12. Evaluate $\lim_{x \rightarrow 2} \frac{\sqrt{x} - \sqrt{2}}{x - 2}$.

13. Determine whether the function $f(x) = \frac{x^3 - x}{x^2 + 1}$ is even or odd.

14. Evaluate $\lim_{x \rightarrow 0} \frac{\sec x - \cos x}{x}$.

15. Express area A of a circle as a function of its circumference.

16. Express perimeter P of a square as a function of its side x.

17. State the sandwich theorem.

18. Define continuity of a function $f(x)$ at $x = a$.

19. Find $f \circ f^{-1}(x)$ if $f(x) = \sqrt{x+1}$.

20. Evaluate $\lim_{x \rightarrow \pi} \frac{\sin x}{\pi - x}$.

21. Evaluate $\lim_{n \rightarrow 0} (1 + 3x)^{2/x}$.

22. Discuss the continuity of $f(x)$ at $x = c$.

$$f(x) = \begin{cases} 3x - 1, & \text{if } x < -1 \\ 4, & \text{if } x = 1, c = 1 \\ 2x, & \text{if } x > 1 \end{cases}$$

23. Discuss the continuity of $f(x)$ at $x = 3$, when,

$$f(x) = \begin{cases} x - 1, & \text{if } x < 3 \\ 2x + 1, & \text{if } 3 \leq x \end{cases}$$

24. Evaluate $\lim_{x \rightarrow -1} \frac{x^3 - x}{x + 1}$.

25. Without finding the inverse, state the domain and range of f^{-1} .

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

b. $f(x) = \frac{x-1}{x-4}$

C. Long Questions

1. If

$$f(x) = \begin{cases} \frac{\sqrt{2x+5} - \sqrt{x+7}}{x-2}, & \text{if } x \neq 2 \\ k, & \text{if } x = 2 \end{cases}$$

Find the value of k , so that $f(x)$ is continuous at $x = 2$.

2. Find the values of m and n , so that given function is continuous at $x = 3$.

$$f(x) = \begin{cases} mx, & \text{if } x < 3 \\ n, & \text{if } x = 3 \\ -2x + 9, & \text{if } x > 3 \end{cases}$$

3. Evaluate

$$\lim_{\theta \rightarrow 0} \frac{1 - \cos p\theta}{1 - \cos q\theta}$$

4. If

$$f(x) = \begin{cases} 3x, & \text{if } x \leq -2 \\ x^2 - 1, & \text{if } -2 < x < 2 \\ 3, & \text{if } x \geq 2 \end{cases}$$

Discuss continuity at $x = 2$ and $x = -2$.

5. Evaluate

$$\lim_{x \rightarrow \infty} \left(\frac{x}{1+x} \right)^x$$

6. Evaluate

$$\lim_{x \rightarrow 0} \frac{e^{1/x} - 1}{e^{1/x} + 1}, x < 0$$

7. Evaluate

$$\lim_{x \rightarrow 0} \frac{e^{1/x} - 1}{e^{1/x} + 1}, x > 0$$

8. Evaluate

$$\lim_{\theta \rightarrow 0} \frac{\tan \theta - \sin \theta}{\sin^3 \theta}$$

9. Prove that $f(f^{-1}(x)) = f^{-1}(f(x)) = x$ if

$$f(x) = (-x + 9)^3$$

10. Evaluate

$$\lim_{x \rightarrow 0} \frac{1 - \cos 2x}{x^2}$$

Answer Keys (MCQs):

1. b

2. b

3. a

4. b

5. b

6. c

7. a

8. a

9. c

10. a

11. a

12. b

13. c

14. b

15. b

16. c

17. b

18. b

19. b

20. b

21. a

22. c

23. a

24. b

25. a

26. b

27. c

28. b

29. a

30. b