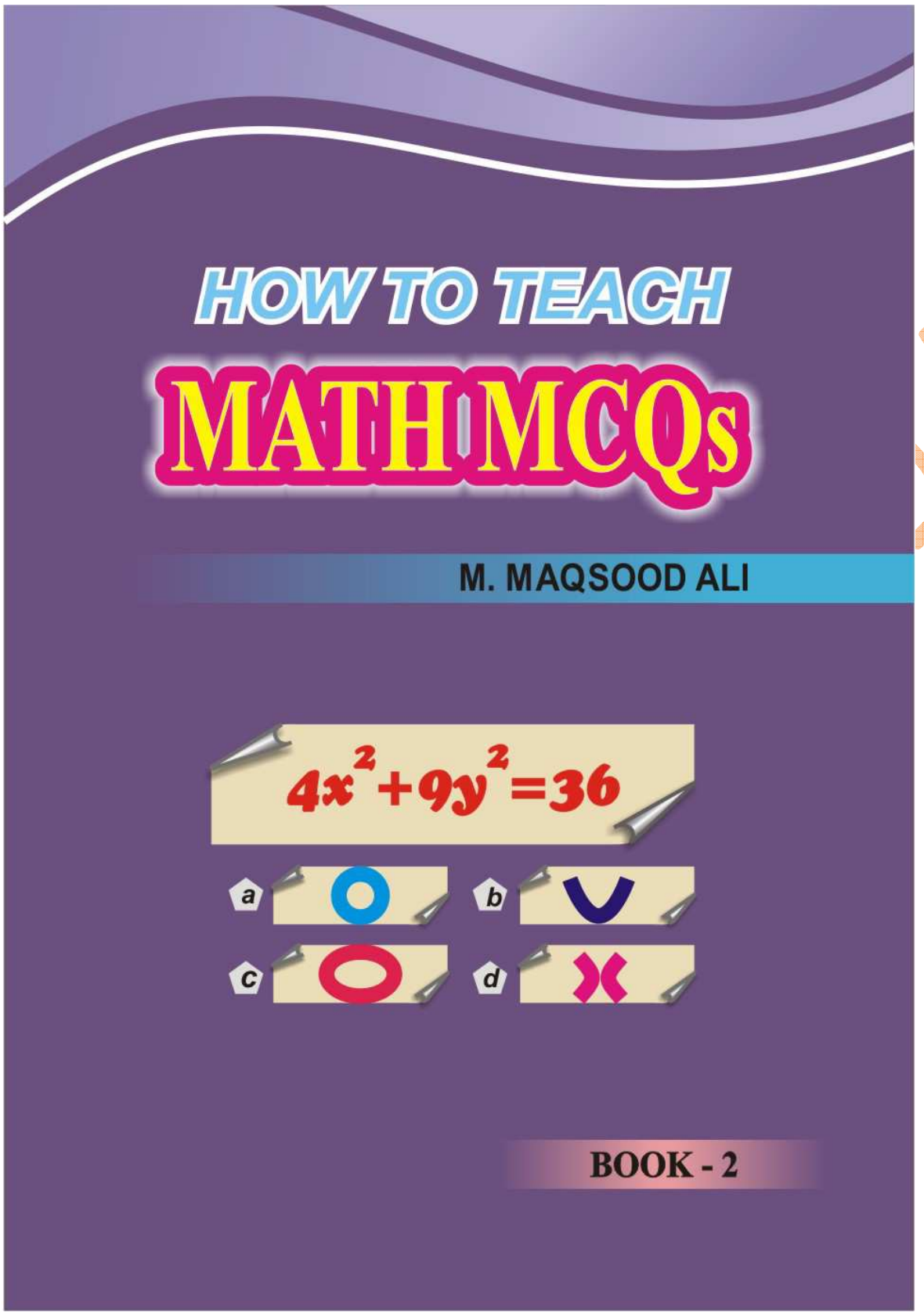
HOW TO TEACH
MATH MCQs
M. MAQSOOD ALI
$4x^2+9y^2=36$
a
b
c
d
BOOK - 2

Chapter 3

LIMITS

INDETERMINATE FORMS

$$\frac{0}{0}\ ,\ 0.\infty\ ,\ 0^0\ ,\ \frac{\infty}{\infty}\ ,\ \infty-\infty\ ,\ \infty^\infty\ ,\ 1^\infty$$

are indeterminate forms.

MCQ-1 :

Which of the following is not an indeterminate form?

(a) $0.\infty$ (b) $\infty+\infty$ (c) $\infty-\infty$ (d) 1^∞

Solution:

since $\infty+\infty=\infty$

$\therefore \infty+\infty$ is not a indeterminate form.

The answer is (b).

MCQ- 2:

Which of the following is an indeterminate form?

(a) $\infty+\infty$ (b) $\infty.\infty$ (c) 0^∞ (d) 1^∞

Solution:

The answer is (d).

LIMIT OF THE FUNCTION

$$\lim_{x\to a} f(x) = b$$

b is the limit of the function at $x \to a$.

DE L' HOPITAL RULE:

$f(x)$ and $g(x)$ are two functions. If the derivatives of both functions exist and $f(a)=0=g(a)$, then

$$\lim_{x\to a}\frac{f(x)}{g(x)}=\lim_{x\to a}\frac{f'(x)}{g'(x)}$$

MCQ- 3:

$\lim_{x\to 5}\frac{(x-5)}{x^2-25}=?$

(a) 1 (b) 0 (c) $1/5$ (d) $1/10$

Solution:

$$\lim_{x\to 5}\frac{(x-5)}{x^2-25}\ ,\quad (\frac{0}{0})$$

$$=\lim_{x\to 5}\frac{(x-5)}{(x-5)(x+5)}$$

$$=\lim_{x\to 5}\frac{1}{x+5}$$

$$=\frac{1}{5+5}$$

$$=\frac{1}{10}$$

The answer is (d).

Second Method: (By De l' Hopital Rule)

$$\lim_{x\to 5}\frac{(x-5)}{x^2-25}\ ,\quad (\frac{0}{0})$$

$$=\lim_{x\to 5}\frac{1}{2x}$$

$$=\frac{1}{10}$$

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LIMIT INVOLVING TRIGONOMETRIC FUNCTIONS

Formula :

$$\lim_{\theta\to 0}\frac{sin\theta}{\theta}=1$$

MCQ- 5:

$\lim_{x\to 0}\frac{cos2x.sin5x}{x}=?$

(a) 10 (b) 0 (c) 5 (d) $\frac{1}{5}$

Solution:

$$\lim_{x\to 0}\frac{cos2x.sin5x}{x}$$

Multiplying and dividing by 5

$$=\lim_{x\to 0}\frac{5cos2x.sin5x}{5x}$$

$$=5\lim_{x\to 0}cos2x\lim_{x\to 0}\frac{.sin5x}{5x}$$

$$=5\,(1)\,(1)$$

$$=5$$

The answer is (c).

EXERCISE-1

(1) $\lim_{x\to 1}\frac{x^2-2x+1}{(x-1)^2}=?$

(a) 0 (b) 1 (c) 2 (d) None

(2) $\lim_{x\to 5}\frac{x-5}{x^2-25}=?$

(a) 1 (b) 0 (c) ∞ (d) $\frac{1}{10}$

(3) $\lim_{x\to 4}\left[\frac{\sqrt[3]{x^2-16}}{(x-4)^{1/3}}\right]=?$

(a) $16^{1/3}$ (b) ∞ (c) $\sqrt[3]{4}$ (d) 2

(4) $\lim_{x\to 2}\left[\frac{(x^3-8)^{3/2}}{\sqrt{x-2}}\right]=?$

(a) ∞ (b) $\sqrt{12}$ (c) $8\sqrt{27}$ (d) $3\sqrt{6}$

(5) $\lim_{x\to 2}\frac{(x^2-4)^2}{(x-2)^2}=?$

(a) 64 (b) 16 (c) 4 (d) ∞

(6)

$\lim_{x\to 2}\frac{x^2-5x+6}{x-2}=?$

(a) -1 (b) 5 (c) 1 (d) ∞

(7) $\lim_{x\to 0}\frac{x^3+6x^2}{x}=?$

(a) 6 (b) ∞ (c) 0 (d) 1

(8) $\lim_{x\to 3}\frac{x^2-5x+6}{x-3}=?$

(a) 1 (b) 3 (c) 5 (d) ∞

(9) $\lim_{x\to 1}\frac{x^2+3x-10}{x^2+2x+1}=?$

(a) $-\frac{1}{6}$ (b) $-\frac{3}{2}$ (c) $\frac{2}{5}$ (d) None

(10) $\lim_{x\to 0}\frac{\sin 5x}{x}=?$

(a) 0 (b) $\frac{0}{0}$ (c) ∞ (d) 5

(11) $\lim_{x\to 0}\frac{\sin\frac{x}{5}}{x}=?$

(a) 5 (b) 0 (c) $\frac{1}{5}$ (d) ∞

(12) $\lim_{x\to 0}\frac{\sin(x-3)}{x-3}=?$

(a) 3 (b) 1 (c) 0 (d) ∞

(13) $\lim\limits_{x\to 0}\frac{\sin 2x}{x\cos x}=?$

(a) $\frac{0}{0}$ (b) $\frac{1}{2}$ (c) 0 (d) 2

(14) $\lim\limits_{x\to \pi}\frac{1+\cos x}{\sin x}=?$

(a) 2 (b) $\frac{1}{2}$ (c) 0 (d) ∞

(15) $\lim\limits_{x\to \pi}\frac{\sin x}{1-\cos x}=?$

(a) 2 (b) $\frac{1}{2}$ (c) 1 (d) 0

(16) $\lim\limits_{x\to \pi}\frac{\tan 2x}{\sin 2x}=?$

(a) 0 (b) 1 (c) ∞ (d) 2

(17) $\lim\limits_{x\to 0}\frac{\sin 2x}{\sin 6x}=?$

(a) $\frac{1}{3}$ (b) 3 (c) $\frac{2}{3}$ (d) ∞

(18) $\lim\limits_{x\to \frac{\pi}{3}}\frac{1-\cos x}{1+\cos x}=?$

(a) 4 (b) $\frac{1}{4}$ (c) 3 (d) $\frac{1}{3}$

(19) $\lim\limits_{x\to \frac{\pi}{3}}\frac{sin^3x\,cos^3x}{tan^3x}=?$

(a) $\frac{1}{32}$ (b) 8 (c) $\frac{1}{64}$ (d) 32

LIMIT $x \to +\infty$ AND $x \to -\infty$

$$\lim_{x\to+\infty} f(x)$$

and

$$\lim_{x\to-\infty} f(x)$$

Short Cut:

$$\lim_{x\to\pm\infty} \frac{a_o + a_1x + a_2x^2 + \cdots + a_nx^n}{b_o + b_1x + b_2x^2 + \cdots + b_mx^m} = \lim_{x\to\pm\infty} \frac{a_nx^n}{b_mx^m}$$

MCQ- 6:

$$\lim_{n\to\infty} \frac{5 + 3x^2 - 4x^4}{2 + x^3 + 16x^4} = ?$$

(a) $\frac{-1}{4}$ (b) $\frac{5}{2}$ (c) $\frac{1}{6}$ (d) 3

Solution:

$$\lim_{x\to\infty} \frac{5 + 3x^2 - 4x^4}{2 + x^3 + 16x^4}$$

$$= \lim_{x\to\infty} \frac{x^4\left(\frac{5}{x^4} + \frac{3}{x^2} - 4\right)}{x^4\left(\frac{2}{x^4} + {}^{1}/_{x} + 16\right)}$$

$$= \frac{{}^{5}/_{\infty} + \frac{3}{\infty} - 4}{{}^{2}/_{\infty} + \frac{1}{\infty} + 16}$$

$$= \frac{0 + 0 - 4}{0 + 0 + 16}$$

$$= -\frac{4}{16}$$

$$= -\frac{1}{4}$$

The answer is (a).

Second Method: (Shortcut)

$$\lim_{x\to\infty}\frac{5+3x^2-4x^4}{2+x^3+16x^4}$$

$$=\lim_{x\to x}\frac{-4x^4}{16x^4}$$

$$=-{}^{4}/_{16}$$

$$=-{}^{1}/_{4}$$

MCQ-7 :

$$\lim_{x\to\infty}\frac{3-5x+9x^3}{2+2x^4}=?$$

(a) ∞ (b) 0 (c) $\frac{9}{2}$ (d) $\frac{3}{2}$

Solution:

$$\lim_{x\to\infty}\frac{3-5x+9x^3}{2+2x^4}$$

$$=\lim_{x\to\infty}\frac{9x^3}{2x^4}$$

$$=\lim_{x\to\infty}\frac{9}{2x}$$

$$=\frac{9}{\infty}$$

$$=0$$

The answer is (b).

MCQ- 8:

$$\lim_{x\to\infty}\frac{5+2x+6x^2}{\sqrt{2x+9x^4}}=?$$

(a) ${}^{5}/_{2}$ (b) ∞ (c) 2 (d) 0

Solution:

$$\lim_{x\to\infty}\frac{5+2x+6x^2}{\sqrt{2x+9x^4}}$$

$$=\lim_{x\to\infty}\frac{6x^2}{\sqrt{9x^4}}$$

$$=\lim_{x\to\infty}\frac{6x^2}{3x^2}$$

$$=2$$

The answer is (c).

EXERCISE-2

(1) $\lim\limits_{x\to\infty}\frac{5+2x+3x^2}{2+8x-9x^2}=?$

(a) $\frac{1}{4}$ (b) $-\frac{1}{3}$ (c) $\frac{5}{2}$ (d) $\frac{3}{8}$

(2) $\lim\limits_{x\to\infty}\left[\frac{\sqrt{2+5x^3-9x^6}}{(5+8x^4-18x^6)^{1/2}}\right]=?$

(a) $\frac{1}{\sqrt{2}}$ (b) $\sqrt{6}$ (c) 4 (d) 1/2

(3) $\lim\limits_{x\to\infty}\left(\frac{5-3x}{x}\right)^3=?$

(a) 8 (b) -27 (c) 125 (d) ∞

(4) $\lim\limits_{x\to\infty}\frac{5+3x^3+8x^5}{2x+3x^2+2x^4}=?$

(a) 8 (b) 4 (c) 0 (d) ∞

(5) $\lim\limits_{x\to-\infty}\frac{\sqrt{4x^2+1}}{x+6}=?$

(a) -2 (b) 2 (c) $\frac{1}{6}$ (d) $-\frac{2}{3}$

(6) $\lim\limits_{x\to-\infty}\frac{2-3x}{\sqrt{16+x^2}}=?$

(a) $-\frac{3}{4}$ (b) $\frac{1}{2}$ (c) -3 (d) 3

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MCQ-10 :

$\lim_{x\to\infty}(1+\frac{2}{x})^{2x}=?$

(a) 0 (b) e (c) e^2 (d) e^4

Solution:

$$\lim_{x\to\infty}(1+\frac{2}{x})^{2x}$$

$$=[\lim_{x\to\infty}(1+\frac{2}{x})^{x}]^2$$

$$=(e^2)^2$$

$$=e^4$$

The answer is (d).

EXERCISE-3

(1) $\lim_{x\to 2}\frac{x^5-32}{x-2}=?$

(a) 90 (b) 80 (c) 64 (d) 120

(2) $\lim_{x\to\infty}\left(1+\frac{5}{x}\right)^{3x}=?$

(a) e^{15} (b) e^5 (c) e^3 (d) $e^{3/5}$

(3) $\lim_{x\to 0}\frac{6^x-1}{x}=?$

(a) 0 (b) ∞ (c) $ln6$ (d) e^6

(4) $\lim_{x\to 0}\frac{e^{5x}-1}{x}=?$

(a) 0 (b) 1 (c) 5 (d) ∞

(5) $\lim_{x\to\infty}\frac{In(1+3^{-x})}{2+e^{-x}}=?$

(a) 0 (b) $\frac{1}{2}$ (c) $\frac{3}{2}$ (d) $\frac{e}{3}$

(6) $\lim_{x\to\infty} \frac{3+e^{-x}}{x} = ?$

(a) ∞ (b) 0 (c) 3 (d) $3e$

(7) $\lim_{x\to-\infty} \frac{2+e^{-t}}{3+5^t} = ?$

(a) $\frac{2}{3}$ (b) $\frac{1}{5}$ (c) ∞ (d) 0

nth TERM OF THE SEQUENCE

a : first term

d : common difference

a_n: nth term

nth term of the sequence

$$a_n = d.n + (a - d)$$

MCQ-11 :

What is the nth term of the sequence 3, 4, 5, . . . ?

(a) $2n + 1$ (b) $3n - 2$ (c) $3n$ (d) $n + 2$

Solution:

3, 4, 5, . . .

$a = 3 \quad , \quad d = 1$

$$a_n = d.n + (a - d)$$

$$a_n = 1.n + (3 - 1)$$

$$a_n = n + 2$$

The answer is (d).

MCQ- 12:

What is the nth term of the sequence 5, 8, 11, . . . ?

(a) $4n + 1$ b) $7n - 2$ (c) $5n$ (d) $2n + 3$

Solution:

5, 8, 11, . . .

$a = 5 \quad , \quad d = 3$

$$a_n = d.n + (a - d)$$

$$a_n = 3.n + (5 - 3)$$

$$a_n = 3n + 2$$

The answer is (b).

LIMIT OF THE SEQUENCE

If a_n is the nth term of the sequence, then

$$\lim_{n\to\infty} a_n = l$$

where l is the limit of the sequence.

MCQ- 13:

$a_n = .\frac{n^2}{n^2+9}$ is the nth term of the sequence. What is the limit of the sequence?

(a) 1 (b) 9 (c) 0 (d) ∞

Solution:

$$\lim_{n\to\infty} a_n = \lim_{n\to\infty} \frac{n^2}{n^2+9}$$

$$= \lim_{n\to\infty} \frac{n^2}{n^2(1+\frac{9}{n^2})}$$

$$= \lim_{n\to\infty} \frac{1}{1+\frac{9}{n^2}}$$

$$= \frac{1}{1+0}$$

$$= 1$$

The answer is (a).

EXERCISE-4

(1) What is the nth term and limit of the sequence $\frac{4}{5}, \frac{7}{11}, \frac{10}{17}, \ldots$?

(a) $\frac{4n}{5n}, \frac{4}{5}$ (b) $\frac{3n+1}{4n+1}, \frac{3}{4}$ (c) $\frac{5n-1}{6n-1}, \frac{5}{6}$ (d) $\frac{3n+1}{6n-1}, \frac{1}{2}$

(2) $a_n = \frac{2n+5}{3+7n}$ is the nth term of a sequence. What is the limit of the sequence?

(a) $\frac{2}{3}$ (b) $\frac{5}{3}$ (c) $\frac{2}{7}$ (d) ∞