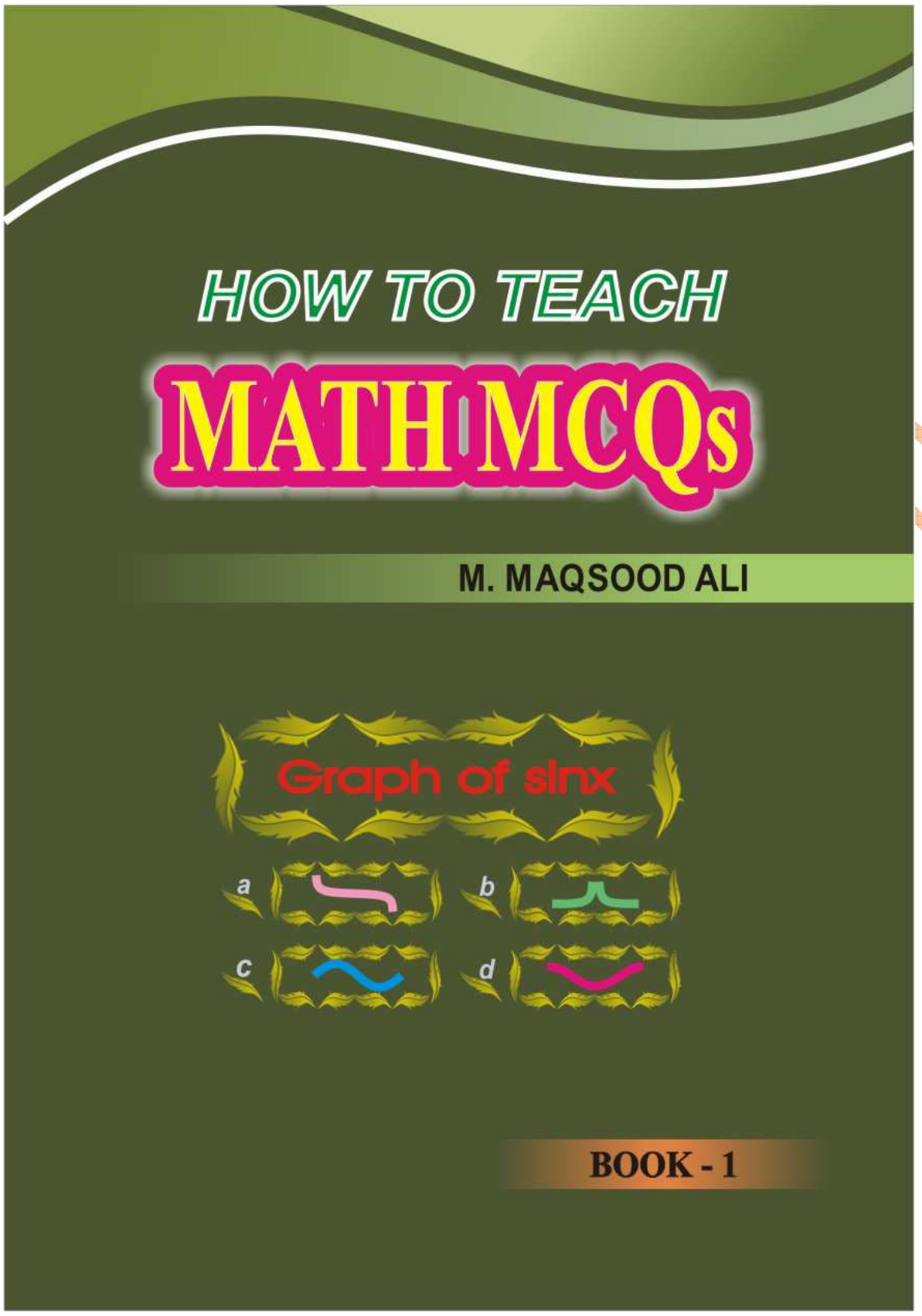
HOW TO TEACH
MATH MCQs
M. MAQSOOD ALI
Graph of sinx
a
b
c
d
BOOK - 1

Chapter 14

TRIGONOMETRIC IDENTITIES

BASIC TRIGONOMETRIC IDENTITIES

The angle is same that is θ for all trigonometric functions given below.

1) $sin^2\theta + cos^2\theta = 1$ {Relation between $sin^2\theta$ and $cos^2\theta$.

i) $sin^2\theta = 1 - cos^2\theta$

ii) $cos^2\theta = 1 - sin^2\theta$

2) $1 + tan^2\theta = sec^2\theta$ {Relation between $tan^2\theta$ and $sec^2\theta$.

i) $sec^2\theta - tan^2\theta = 1$

ii) $sec^2\theta - 1 = tan^2\theta$

3) $1 + cot^2\theta = cosec^2\theta$ {Relation between $cot^2\theta$ and $cosec^2\theta$.

i) $cosec^2\theta - cot^2\theta = 1$

ii) $cosec^2\theta - 1 = cot^2\theta$

Note: Above three formulae are used when the power of trigonometric function is square.

RECIPROCAL OF TRIGONOMETRIC FUNCTIONS

1) $cosec\theta = \frac{1}{sin\theta}$

2) $sec\theta = \frac{1}{cos\theta}$

3) $cot\theta = \frac{1}{tan\theta}$ or $cot\theta = \frac{cos\theta}{sin\theta}$

4) $tan\theta = \frac{sin\theta}{cos\theta}$

MCQ- 1:

$sec^2\theta + cosec^2\theta - tan^2\theta$ =?

(a) $1 + sec^2\theta$ (b) $cosec^2\theta$

(c) $1 + cosec^2\theta$ (d) $1 - tan^2\theta$

Solution:

$sec^2\theta + cosec^2\theta - tan^2\theta$

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$$= \frac{cos\theta\ cos\theta}{sin\theta}$$

$$= cos\theta\ cot\theta$$

The answer is (d).

EXERCISE-1

(1) $\sin^3\theta - \frac{1}{\text{cosec}\theta} = ?$

(a) $\sin\theta \sec\theta$ (b) $\sin\theta \cos^2\theta$ (c) $-\sin\theta \cos^2\theta$ (d) $-\sin^3\theta$

(2) $\sec^2\theta + \text{cosec}^2\theta = ?$

(a) $\cot^2\theta$ (b) $\sec^2\theta\ \text{cosec}^2\theta$ (c) $\tan^2\theta + \cot^2\theta$ (d) $\sin\theta\cos\theta$

(3) $\tan^2\theta - cot^2\theta = ?$

(a) $1 + cosec^4\theta$ (b) $\sin^2\theta - cos^2\theta$ (c) $\tan^2\theta\ \cot^2\theta$ (d) $\sec^2\theta - \text{cosec}^2\theta$

(4) $\cot^4\theta\ \text{cosec}^4\theta = ?$

(a) $\cos^4\theta\ \text{cosec}^8\theta$ (b) $\text{cosec}^4\theta$ (c) $\text{cosec}^2\theta\ \tan^2\theta$ (d) $\cos^2\theta - \sin^2\theta$

(5) $\cot^4\theta - cosec^4\theta = ?$

(a) $\text{cosec}^2\theta - 2$ (b) $1 + 2\cot^2\theta$ (c) $1 - 2\text{cosec}^2\theta$ (d) $-1 - \cot^4\theta$

(6) $\frac{1}{\sec^2\theta} + \frac{1}{\text{cosec}^2\theta} = ?$

(a) $2\cos^2\theta + 1$ (b) 1 (c) $1 - 2\sin^2\theta$ (d) $\cot^2\theta + \tan^2\theta$

(7) $\left(\frac{\sin^2\theta+\cos^2\theta}{\sec^2\theta - \tan^2\theta}\right)\left(\text{cosec}^2\theta - \cot^2\theta\right) = ?$

(a) $\sec^2\theta\ cosec^2\theta$ (b) $\tan^4\theta$ (c) $2\sin^2\theta$ (d) 1

(8) $1 + \cos^2\theta = ?$

(a) $2\sin^2\theta$ (b) $\sin^2\theta$ (c) $2 - \sin^2\theta$ (d) 2

(9) $\frac{\sin\theta}{\text{cosec}\theta} + \frac{\cos\theta}{\sec\theta} = ?$

(a) $2\sin^2\theta$ (b) 1 (c) $\sin^2\theta\ \cos^2\theta$ (d) $2\sec^2\theta\ \text{cosec}^2\theta$

(10) $\sqrt{3\sec^2\theta + \tan^2\theta + 1}$

(a) $2\sec\theta$ (b) $\sec\theta + \tan\theta$ (c) $\sqrt{2}\tan\theta$ (d) $\sqrt{4 + \tan^2\theta}$

COMPOUND ANGLE FORMULA

1) $\sin(\alpha+\beta) = sin\alpha\ cos\beta + cos\alpha\ sin\beta$
2) $\sin(\alpha-\beta) = sin\alpha\ cos\beta - cos\alpha\ sin\beta$
3) $cos(\alpha+\beta) = cos\alpha\ cos\beta - sin\alpha\ sin\beta$
4) $cos(\alpha-\beta) = cos\alpha\ cos\beta + sin\alpha\ sin\beta$
5) $\tan(\alpha+\beta) = \frac{tan\alpha+tan\beta}{1-tan\alpha\ tan\beta}$
6) $\tan(\alpha-\beta) = \frac{tan\alpha-tan\beta}{1+tan\alpha\ tan\beta}$

MCQ- 3:

$cos5\theta\ cos\theta - sin5\theta\ sin\theta = ?$

(a) $cos4\theta$ (b) $cos6\theta$ (c) $sin4\theta$ (d) $sin\theta\ cos\theta$

Solution:

$$cos5\theta\ cos\theta - sin5\theta\ sin\theta$$

$$cos\alpha\ cos\beta - sin\alpha\ sin\beta = cos(\alpha+\beta)$$

$$= \cos(5\theta+\theta)$$
$$= cos6\theta$$

The answer is (b).

MCQ- 4:

$$sin200^o\ cos140^o - cos200^o\ sin140^o = ?$$

(a) $^1/_2$ (b) $^1/_{\sqrt{2}}$ (c) $^{\sqrt{3}}/_2$ (d) $^2/_5$

Solution:

$$sin200^o\ cos140^o - cos200^o\ sin140^o$$

$$sin\alpha\ cos\beta - cos\alpha\ sin\beta = \sin(\alpha-\beta)$$

$$= \sin(200^o - 140^o)$$
$$= sin60^o$$

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(5) $cos\ 100^0\ sin\ 70^0\ -\ sin\ 100^0\ cos\ 70^0\ =?$

(a) 0 (b) 0.5 (c) $-$ 0.5 (d) $\sqrt{\frac{3}{2}}$

(6) $\frac{1+\tan 135^0 \tan 45^0}{\tan 135^0 - \tan 45^0} =?$

(a) 0 (b) 1 (c) ∞ (d) -1

(7) $\frac{1-\tan 20^0 \tan 25^0}{\tan 20^0+\tan 25^0} =?$

(a) 0 (b) ∞ (c) 1 (d) -1

(8) $sin\ (30^0 + 45^0) =?$

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

(9) $cos\ (45^0 - 60^0) =?$

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

(10) $cos\ (\alpha + \beta)\ +\ cos\ (\alpha - \beta)$

(a) $-2\sin\alpha\cos\beta$ (b) $2\cos\alpha\sin\beta$ (c) $2\cos\alpha\cos\beta$ (d) $2\sin\alpha\sin\beta$

DOUBLE ANGLE FORMULAE

1) $sin2\alpha = 2\,sin\alpha\,cos\alpha$

2) i) $cos2\alpha = cos^2\alpha - sin^2\alpha$

ii) $cos2\alpha = 2cos^2\alpha - 1$

iii) $cos2\alpha = 1 - 2sin^2\alpha$

3) $tan2\alpha = \frac{2tan\alpha}{1-tan^2\alpha}$

HALF ANGLE FORMULAE

1) $sin\frac{\alpha}{2} = \pm\sqrt{\frac{1-cos\alpha}{2}}$

2) $cos\frac{\alpha}{2} = \pm\sqrt{\frac{1+cos\alpha}{2}}$

3) $tan\frac{\alpha}{2} = \frac{sin\alpha}{1+cos\alpha} = \frac{1-cos\alpha}{sin\alpha}$

PRODUCT INTO SUM FORMULAE

1) $sin\alpha\,cos\beta = \frac{1}{2}\{\sin(\alpha+\beta) + \sin(\alpha-\beta)\}$

2) $cos\alpha\,sin\beta = \frac{1}{2}\{\sin(\alpha+\beta) - \sin(\alpha-\beta)\}$

3) $cos\alpha\,cos\beta = \frac{1}{2}\{\cos(\alpha+\beta) + \cos(\alpha-\beta)\}$

4) $sin\alpha\,sin\beta = -\frac{1}{2}\{\cos(\alpha+\beta) - \cos(\alpha-\beta)\}$

SUM INTO PRODUCT FORMULAE

1) $sinu + sinv = 2\,sin\frac{u+v}{2}\,cos\,\frac{u-v}{2}$

2) $sinu - sinv = 2\,cos\frac{u+v}{2}\,sin\frac{u-v}{2}$

3) $cosu + cosv = 2\,cos\frac{u+v}{2}\,cos\frac{u-v}{2}$

4) $cosu - cosv = -2\,sin\frac{u+v}{2}\,sin\frac{u-v}{2}$

MCQ- 6:

$$2sin15^o\ cos15^o = ?$$

(a) 0 (b) $^1/_2$ (c) 1 (d) $^{\sqrt{3}}/_2$

Solution:

$$2sin15^o\ cos15^o$$

$$2\ sin\alpha\ cos\alpha = sin2\alpha$$

$$= sin2(15^o)$$

$$= sin30^o$$

$$= {}^1/_2$$

The answer is (b).

EXERCISE-3

(1) $2cos\ \alpha - sin\ \alpha\ sin\ 2\alpha = ?$

(a) $2cos^2\alpha - sin\alpha$ (b) $2sin^3\alpha$ (c) $2(cos\ \alpha - sin^2\alpha)$ (d) $2\ cos^3\alpha$

(2) $sin^2({}^\alpha/_2) + \frac{\cos\alpha}{2}$

(a) $\frac{1}{2}$ (b) 1 (c) $tan\ \alpha/2$ (d) $1 + cosec^2\alpha$

(3) $\sqrt{1+\cos 2\alpha} = ?$

(a) $\sqrt{\cos^2\alpha - \sin^2\alpha}$ (b) $\sqrt{2}\cos\alpha$ (c) $\sqrt{1+2\cos^2\alpha}$ (d) $\sqrt{2}\sin\alpha$

(4) $2\ sin15^0 cos15^0 = ?$

(a) 0.25 (b) 0.5 (c) 0.87 (d) 0.17

(5) $2\ sin\ 3\alpha\ cos\ \alpha = ?$

(a) $\cos 4\alpha + \cos 2\alpha$ (b) $\sin 4\alpha - \sin 2\alpha$

(c) $sin\ 4\alpha + sin\ 2\alpha$ (d) $cos\ 4\alpha - sin2\alpha$

(6) $2\ cos\ 4\alpha\ cos\ 2\alpha\ =?$

(a) $\cos 6\alpha - \cos 2\alpha$ (b) $\sin 6\alpha + \sin 2\alpha$

(c) $sin\ 6\alpha - sin\ 2\alpha$ $(d)\ cos\ 6\alpha\ +\ cos\ 2\alpha$

(7) $sin\ 5\alpha\ +\ sin\ \alpha\ =?$

(a) $2\cos 3\alpha \sin 2\alpha$ (b) $2\sin 3\alpha \cos 2\alpha$

(c) $2\ sin\ 3\alpha\ sin\ \alpha$ (d) $2\ cos\ 3\alpha\ cos\ \alpha$

(8) $cos\ 3\alpha - cos\ \alpha\ =?$

(a) $2\sin 2\alpha \cos \alpha$ (b) $-2\sin 2\alpha \sin \alpha$

(c) $2\ cos\ 2\alpha\ cos\ \alpha$ (d) $-2sin^2\alpha\ cos\ \alpha$

(9) $tan\ \frac{\alpha}{2}=?$

(a) $\frac{sin\alpha}{1+cos\alpha}$ (b) $\frac{1+cos\alpha}{sin\alpha}$

(c) $\frac{2\ tan\alpha}{1-\ tan^2\alpha}$ (d) $1\ +\ cot\ \frac{\alpha}{2}$

(10) $\frac{1-\cos\alpha}{1+\cos\alpha}=?$

(a) $2cos^2\frac{\alpha}{2}$ (b) $tan^2\frac{\alpha}{2}$ (c) $1\ +\ cot\ \alpha$ $(d)\ cos\ \alpha - sin\ \alpha$

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