

1989 MAΘ NATIONAL CONVENTION  
TRIGONOMETRY TEST

- 1) Find the value of  $\cos \left( \text{Arc sin } \frac{4}{5} + \text{Arc tan } \frac{5}{12} \right)$ .
- a)  $\frac{-33}{65}$     b)  $\frac{16}{65}$     c)  $\frac{56}{65}$     d)  $\frac{63}{65}$     e) nota
- 2) If  $\sin 2x = \frac{24}{25}$ , find the value of  $\sin^4 x + \cos^4 x$ .
- a)  $\frac{1}{25}$     b)  $\frac{13}{25}$     c)  $\frac{49}{625}$     d)  $\frac{337}{625}$     e) nota
- 3) If  $\sin A = \frac{24}{25}$ , and  $90^\circ < A < 180^\circ$ , find the value of  $\sin \frac{A}{2}$ .
- a)  $-\frac{4}{5}$     b)  $\frac{4}{5}$     c)  $-\frac{9}{25}$     d)  $\frac{9}{25}$     e) nota
- 4) Find the degree measure of all angles A for which  $-180^\circ < A \leq 180^\circ$  and  $\cos^2 A + 2\sin A = 1$ .
- a)  $0^\circ, 180^\circ$     b)  $0^\circ, 90^\circ$     c)  $0^\circ, -180^\circ$     d)  $\emptyset$     e) nota
- 5) If  $\tan \theta + \cot \theta = \frac{10}{3}$  and  $0 < \theta < \frac{\pi}{2}$ , find all possible values of  $\sec \theta$ .
- a)  $\sqrt{10}$     b)  $\sqrt{10}, \frac{\sqrt{10}}{3}$     c)  $\sqrt{3}$     d)  $\sqrt{3}, \frac{\sqrt{3}}{10}$     e) nota

- 6) In  $\triangle ABC$ ,  $\sin^2 A + \sin^2 B = 1$ . Find the degree measure of angle C.  
 a)  $30^\circ$    b)  $45^\circ$    c)  $90^\circ$    d) cannot be done   e) nota
- 7) If  $0 < x < \pi$  and  $2^{\tan x} = 8^{\sin x}$ , find the numerical value of  $\cos x$ .  
 A) 0   b)  $\frac{1}{2}$    c)  $\frac{1}{3}$    d)  $\frac{1}{4}$    e) nota
- 8) If  $\sin^2 15^\circ$  is one root of  $x^2 + bx + c = 0$ , find the ordered pair of rational numbers  $(b, c)$ .  
 a)  $(\frac{1}{4}, \frac{1}{16})$    b)  $(-1, -\frac{1}{8})$    c)  $(\frac{1}{4}, -\frac{1}{8})$    d)  $(-1, \frac{1}{16})$    e) nota
- 9) Evaluate  $\sin (2 \text{ Arc tan } 3)$   
 a)  $\frac{3\sqrt{2}}{2}$    b)  $\frac{3\sqrt{10}}{10}$    c)  $\frac{\sqrt{10}}{10}$    d)  $\frac{\sqrt{2}}{2}$    e) nota
- 10) Solve,  $2 \sec x = \tan x + \cot x$ ,  $0 \leq x < 2\pi$ .  
 a)  $\pi/6, 5\pi/6$    b)  $\pi/3, 2\pi/3$    c)  $\pi/6, 11\pi/6$    d)  $\pi/3, 5\pi/3$    e) nota

11) Solve,  $\cos x - \sqrt{3} \sin x = 1$ ,  $0 \leq x < 2\pi$ .  
a) 0    b)  $0, 2\pi/3$     c)  $0, 4\pi/3$     d)  $0, 2\pi/3, 4\pi/3$     e) nota

12) Solve,  $\sin 2x = \cos 2x$ ,  $0 \leq x < 2\pi$ .  
a)  $\pi/4, 5\pi/4$     b)  $\pi/4, 3\pi/4, 5\pi/4, 7\pi/4$     c)  $\pi/8, 5\pi/8$   
d)  $\pi/8, 5\pi/8, 9\pi/8, 13\pi/8$     e) nota

13) Two sides of a triangle are 10 and 12 inches long. The included angle is  $60^\circ$ . Find the 3rd side.  
a)  $2\sqrt{30}$     b)  $2\sqrt{31}$     c)  $\sqrt{30}$     d)  $\sqrt{31}$     e) nota

14) From the top of a building the angles of depression of 2 equal size stakes are  $30^\circ$  and  $60^\circ$ . The stakes are on the same side of the building and are 100' apart, in line with the observer. How high is the building?  
a) 100    b) 50    c)  $50\sqrt{3}$     d)  $100\sqrt{3}$     e) nota

15) A regular octagon is inscribed in a circle of radius 4". Find the area of this octagon.  
a)  $4\sqrt{2}$     b)  $8\sqrt{2}$     c)  $16\sqrt{2}$     d)  $32\sqrt{2}$     e) nota

16) Find the tangent of the acute angle between the curves  $y=x^2$  and  $xy=1$  at the point  $(1,1)$ .

- a) 3    b) 1    c)  $\sqrt{3}$     d)  $1/\sqrt{3}$     e) nota

17)  $\sqrt{\sin^2 x}$  is negative for:

- a) all  $x$     b)  $\pi < x < 2\pi$     c)  $-\pi/2 < x < \pi/2$     d) all positive  $x$     e) nota

18) Let  $f(x) = \cos(\text{Arctan } x)$ . What is the range of  $f$ ?

- a)  $\{x \mid -\pi < x < \pi\}$     b)  $\{x \mid 0 < x \leq 1\}$     c)  $\{x \mid 0 \leq x \leq 1\}$   
d)  $\{x \mid -1 < x < 1\}$     e) nota

19) The polar graph of  $r = \frac{18}{5+4\sin\theta}$  is:

- a) a cardioid    b) a lemniscate    c) an ellipse    d) a hyperbola  
e) nota

20) If the positive solutions of the equation  $\sin 3x \cos 2x = \cos 2x$  are ranked in increasing order, then the fourth solution is:

- a)  $\pi/6$     b)  $\pi/4$     c)  $5\pi/6$     d)  $3\pi/4$     e) nota

21) The series  $1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots$  equals:

- a)  $\sin x$    b)  $\cos x$    c)  $\arcsin x$    d)  $\arctan x$    e) nota

22) What statements below are true?

I.  $-\pi/2 \leq \cos^{-1} x \leq \pi/2$

II.  $-\pi/2 \leq \sin^{-1} x \leq \pi/2$

III.  $\sin^{-1} x = -\sin^{-1}(-x)$  for all  $x$  in the domain of  $\sin^{-1}$

- a) I only   b) II only   c) I and III only   d) II and III only  
e) nota

23) Determine the amplitude of  $f(\theta) = \sin \theta + \sqrt{3} \cos \theta$ .

- a) 2   b) 1   c)  $\sqrt{3}$    d)  $\sqrt{2}$    e) nota

24) Evaluate:  $e^{\pi/2}$

- a) 0   b) -1   c) 1   d)  $i$    e) nota

25) Write a formula for the displacement  $d$  of a particle undergoing a simple harmonic motion which has amplitude 2 and a frequency of 4 cycles/second.

- a)  $d = 2 \sin 4\pi t$    b)  $d = 2 \sin 8\pi t$    c)  $d = 4 \sin 4\pi t$    d)  $d = 4 \sin 2\pi t$   
e) nota

26) Find the measure of the smaller angle formed by the vectors  $(1, 2, 1)$ ,  $(2, 1, -1)$ .

- a)  $\pi/3$    b)  $\pi/4$    c)  $\pi/6$    d)  $2\pi/3$    e) nota

27) Find  $\sin \frac{5\pi}{12}$

- a)  $\frac{\sqrt{6}-\sqrt{2}}{4}$    b)  $\frac{\sqrt{6}+\sqrt{2}}{4}$    c)  $\frac{\sqrt{3}+2}{4}$    d)  $\frac{\sqrt{3}-2}{4}$    e) nota

28) If  $\theta = \cos^{-1} \frac{1}{5}$ , find  $\sin \frac{\theta}{2}$

- a)  $\pm \frac{\sqrt{15}}{5}$    b)  $\frac{\sqrt{15}}{5}$    c)  $\frac{\sqrt{10}}{5}$    d)  $\pm \frac{\sqrt{10}}{5}$    e) nota

29) Find  $x$  if  $\cos^{-1} 2x = \sin^{-1} x$ .

- a)  $\frac{\sqrt{5}}{2}$    b)  $\frac{\sqrt{10}}{5}$    c)  $\frac{\sqrt{5}}{5}$    d)  $\frac{\sqrt{10}}{2}$    e) nota

30) If  $\tan A = -2/3$  and  $\sin A > 0$ , find  $\csc 2A$

- a)  $\frac{13}{12}$    b)  $-\frac{13}{12}$    c)  $\frac{12}{13}$    d)  $-\frac{12}{13}$    e) nota