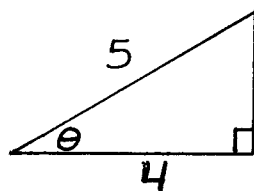


Note: For all questions, choice E., NOTA, means "none of the above."

1. In the picture below, what is the value of  $\sin \theta + \cos \theta$ ?



- A.  $\frac{7}{5}$       B.  $\frac{12}{5}$       C.  $\frac{3}{4}$       D.  $\frac{35}{12}$       E. NOTA
2.  $\frac{2 \tan \theta}{1 + \tan^2 \theta} = ?$ , for  $0 < \theta < \frac{\pi}{2}$
- A.  $\sin 2\theta$       B.  $\cos 2\theta$       C.  $\tan 2\theta$       D.  $\sec 2\theta$       E. NOTA
3. What are the rectangular coordinates of the polar coordinates  $(2, -60^\circ)$ ?
- A.  $(1, \sqrt{3})$       B.  $(\sqrt{3}, -1)$       C.  $(1, -\sqrt{3})$       D.  $(-\sqrt{3}, -1)$       E. NOTA
4. What values of  $x$  satisfy  $|\tan x| > 1$ , for  $0 \leq x < 2\pi$ ?
- A.  $(\frac{\pi}{4}, \frac{7\pi}{4})$       B.  $(\frac{\pi}{4}, \frac{3\pi}{4}) \cup (\frac{5\pi}{4}, \frac{7\pi}{4})$       C.  $[\frac{\pi}{4}, \frac{7\pi}{4}]$       D.  $[\frac{\pi}{4}, \frac{3\pi}{4}] \cup [\frac{5\pi}{4}, \frac{7\pi}{4}]$       E. NOTA
5. If  $\cos(3x) = M \cos^3 x + N \cos x$ , what is the value of  $M + N$ ?
- A. 1      B. 3      C. 5      D. 7      E. NOTA
6. Find the area of  $\Delta PQR$  to the nearest whole unit if  $q = 7.6$ ,  $r = \frac{47}{9}$ , and  $m\angle P = 38^\circ$ .
- A. 12      B. 14      C. 16      D. 18      E. NOTA
7. How many of the following are odd functions?
- I.  $y = \sin x - 1$       II.  $y = \cot x + x^3$       III.  $y = \tan x + \sin x$   
 IV.  $y = x + \tan x$       V.  $y = \cos(x + \frac{\pi}{2})$       VI.  $y = (\tan x)(\sin x)$
- A. 3      B. 4      C. 5      D. 6      E. NOTA
8. A 10-foot ladder is leaning against a building. The top of the ladder is 8 feet off the ground. If the top of the ladder slides 4 feet down the building, what is the change in the angle of elevation at the base of the ladder to the nearest thousandth of a radian?
- A. 0.514      B. 0.515      C. 0.516      D. 0.517      E. NOTA

9. In which quadrant does an angle of 44 radians lie?
- A. I      B. II      C. III      D. IV      E. NOTA
10. Evaluate:  $\sum_{n=1}^{2001} [\sin^n(90n)^\circ + \cos^n(90n)^\circ]$
- A. 0      B. 1      C. 1000      D. 1001      E. NOTA
11. If  $\cos 22.5^\circ = \sqrt{\frac{2+\sqrt{X}}{Y}}$ , what is the value of  $10Y + X^3$ ?
- A. 21      B. 28      C. 41      D. 48      E. NOTA
12. For any real number  $m$ , the graph of the polar equation  $2r = m\theta$  is a
- A. limacon      B. cardioid      C. rose with  $m$  leaves  
D. rose with  $\frac{m}{2}$  leaves      E. NOTA
13. Which function(s) have a period of  $\pi$ ?
- I.  $y = \tan(x + \frac{\pi}{2}) - 1$       II.  $y = -2\sin(2x) - 3$       III.  $y = \frac{1}{2}\cos(2x - \frac{\pi}{4}) + 2$
- A. I, II only      B. I, III only      C. II, III only      D. I, II, and III      E. NOTA
14.  $\frac{(3cis100^\circ)^3(4cis80^\circ)^4}{(3cis64^\circ)^5(2cis50^\circ)^6} =$
- A.  $\frac{4}{9}$       B.  $\frac{4}{5}$       C.  $\frac{283}{307}$       D.  $\frac{25}{27}$       E. NOTA
15. If  $q \sec\theta = \frac{\cos\theta}{1 - \sin\theta} + \frac{1 - \sin\theta}{\cos\theta}$ , where  $\cos\theta \neq 0$ ,  $\sin\theta \neq 1$ , then what is the value of  $q$ ?
- A. -1      B.  $-\frac{1}{2}$       C. 1      D. 2      E. NOTA
16.  $\cot x + \cot^2 x + \cot^3 x + \dots = \frac{\sqrt{5}}{4}$ . If  $\tan x = \frac{A\sqrt{B}+C}{15}$ , where  $\sqrt{B}$  is in simplest radical form, find  $A + B + C$ .
- A. 2      B. 4      C. 12      D. 32      E. NOTA
17. What is the secant of the largest angle of a triangle whose sides are 4, 6, and 7?
- A.  $\frac{27}{23}$       B.  $\frac{56}{29}$       C.  $\frac{17}{7}$       D.  $\frac{114}{41}$       E. NOTA

18. If  $\cot x = a$  and  $\cot y = b$ , find  $\cot(x - y)$  in terms of  $a$  and  $b$ , for  $ab \neq 0$ , and  $|a| \neq |b|$ .
- A.  $\frac{ab-1}{a+b}$     B.  $\frac{ab+1}{a+b}$     C.  $\frac{ab-1}{a-b}$     D.  $\frac{ab+1}{a-b}$     E. NOTA
19. What is the probability (to the nearest thousandth) that any real value  $x$  selected at random will satisfy the inequality  $.6 < \sin x < .7$  ?
- A. 0.005    B. 0.010    C. 0.021    D. 0.042    E. NOTA
20.  $1 = \sin^2 x + \sin^2 y$  for acute angles (with radian measures)  $x$  and  $y$ . Let  $M = |x| + |y|$ . Round  $M$  to the nearest ten-thousandths place and then add the digits to the right of the decimal point in the result.
- A. 12    B. 19    C. 20    D. 28    E. NOTA
21. Which of the following is the inverse of the function  $f(x) = \sinh(x)$ ?
- A.  $y = \frac{1}{2} \ln\left(\frac{1+x}{1-x}\right)$     B.  $y = \ln(x + \sqrt{x^2 + 1})$     C.  $y = \ln(x + \sqrt{x^2 - 1})$
- D.  $y = \ln(x + \sqrt{1 - x^2})$     E. NOTA
22. Evaluate:  $\lim_{x \rightarrow \infty} \frac{\sin x + \cos x}{x}$
- A. -1    B. 0    C. 1    D. 2    E. NOTA
23. What is the graph of the parametric equations  $x = \sec \theta$  and  $y = \tan \theta$  ?
- A. circle    B. parabola    C. ellipse    D. hyperbola    E. NOTA
24. What is  $A^{-1}$  if  $A = \begin{bmatrix} -\cos x & \sin x \\ \sin x & \cos x \end{bmatrix}$  and  $0 < x < \frac{\pi}{2}$  ?
- A.  $\begin{bmatrix} \cos x & -\sin x \\ -\sin x & -\cos x \end{bmatrix}$     B.  $\begin{bmatrix} -\cos x & \sin x \\ \sin x & \cos x \end{bmatrix}$     C.  $\begin{bmatrix} \cos x & \sin x \\ \sin x & -\cos x \end{bmatrix}$
- D.  $\begin{bmatrix} -\cos x & -\sin x \\ -\sin x & \cos x \end{bmatrix}$     E. NOTA

25. If the ellipse  $4x^2 + y^2 = 1$  has an area of  $M$  square units, then what is the value of  $\sin M$ ?
- A. -1      B. 0      C.  $\frac{1}{2}$       D. 1      E. NOTA
26.  $\frac{(\sec x) - 1}{(\sec x) + 1} = \tan^2\left(\frac{P}{Q}x\right)$ , where  $P$  and  $Q$  are positive integers and  $\frac{P}{Q}$  is in lowest terms. What is the value of  $P + Q$  for  $0 < x < \frac{\pi}{2}$ ?
- A. 3      B. 4      C. 5      D. 6      E. NOTA
27.  $\csc^2 x (\cos^4 x - 1 - \sin^4 x) = ?$  For  $\sin x \neq 0$ .
- A. -2      B. -1      C. 1      D. 2      E. NOTA
28. What is the value of  $\text{Arctan}(\bar{.26}) + \text{Arcsin}(\bar{.48})$  rounded to the nearest tenth of a degree?
- A. 56.4      B. 56.5      C. 56.6      D. 56.7      E. NOTA
29. Ship 1 leaves point X and travels 25 miles south, 30 miles east, 50 miles north, and 15 miles east at a constant velocity of 20 mph to arrive at point Y. Ship 2 leaves point X 30 minutes later than ship 1 and heads directly for point Y. At what velocity in miles per hour must ship 2 travel to meet ship 1 so that they arrive at point Y at the same time?
- A.  $\frac{10\sqrt{53}}{11}$       B.  $\frac{11\sqrt{53}}{10}$       C.  $\frac{10\sqrt{106}}{11}$
- D.  $\frac{11\sqrt{106}}{10}$       E. NOTA
30. If  $y = \sqrt{\csc x + \sqrt{\csc x + \sqrt{\csc x + \dots}}}$ , find  $x$  in terms of  $y$  for  $0 < x < \frac{\pi}{2}$ .
- A.  $\text{Arccsc}[y(y - 1)]$       B.  $\text{Arccsc}(y^2)$       C.  $\text{Arccsc}(1 - y^2)$
- D.  $\text{Arccsc}(1 + y^2)$       E. NOTA