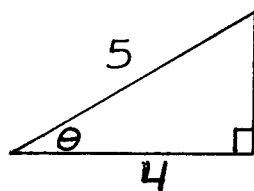


Note: For all questions, choice E., NOTA, means "none of the above."

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 ΔPQR 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 π ?
- 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