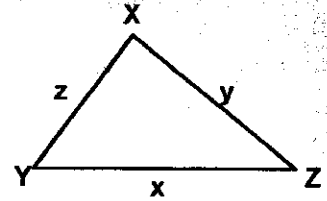## NONE OF THE ANSWERS GIVEN IS CORRECT CHOOSE NOTA (NONE OF THESE ANSWERS).

1. Which of the following identities is an expression equal to the area of $\triangle XYZ$.

   A) $xy \sin Z$
   B) $xz \sin Y$
   C) $\frac{1}{2} yz \sin Y$
   D) $\frac{1}{2} xy \sin Z$
   E) NOTA

2. Let $f(t) = 6t - 2$ and $g(t) = t - t^2$. Find the composite function $g(f(t))$.

   A) $-36t^2 - 18t + 2$
   D) $-t^2 + 6t - 2$

   B) $-36t^2 + 30t - 6$
   E) NOTA

   C) $-6t^2 + 6t - 2$

3. Which of the following graphs are even functions.

   i) $y = 2$　　　**ii)** $y = |x| - 1$　　　**iii)** $y = |x - 1|$　　　**iv)** $y = x^3 + x^2$　　　**v)** $x^2 + y^2 = 1$

   A) i, ii only　　　B) i, ii, iii only　　　C) i, ii,iii, iv only　　　D) ii only　　　E) NOTA

4. Which condition is sufficient for concluding that f and g are inverses of each other?

   A) $f(g(x)) = g(f(x))$ for all x in the domain of f and g.
   B) $f(g(x)) = x$ for all x in the domain of g and $g(f(x)) = x$ for x in the domain of f.
   C) f is always positive and g is always negative.
   D) f and g each pass the vertical line test.
   E) NOTA

5. A rotary sprinkler irrigates a $40°$ sector with a radius of 20 meters. To the nearest hundredth, what is the area of the irrigated section?

   A) 13.96 m^2　　　B) 27.92 m^2　　　C) 139.63 m^2　　　D) 279.26 m^2　　　E) NOTA

6. Evaluate $\sin(\theta - 2\pi) + \sin(\theta - \pi)$.

   A) 2　　　B) 0　　　C) -2　　　D) $\sin(3\theta)$　　　E) NOTA

7. Express $\cos(4\theta)$ as a function of $\cos\theta$ only.

   A) $4\cos^4\theta - 4\cos^2\theta + 1$

   B) $8\cos^4\theta - 4\cos^2\theta + 1$

   C) $8\cos^2\theta - 8\cos^2\theta + 1$

   D) $8\cos^4\theta - 8\cos^2\theta + 1$　　　E) NOTA

8. Which of the following is **NOT** a root of $x^4 + 81 = 0$.

   A) $3cis\,45$　　　B) $3cis\,135$　　　C) $3cis\,180$　　　D) $3cis\,225$　　　E) NOTA

9. A wheel is spinning with an angular velocity of 100 rad/sec. Find the distance in cm. travelled during $\frac{1}{10}$ sec. by a point on the wheel that is 10 cm from the wheel's center.

A) 100 cm   B) 10 cm   C) 10π D) 100π E) NOTA

10. Find the equality that is **NOT** an identity.

A) $\sin(\pi - \theta) = \sin\theta$ B) $\cos(\pi + \theta) = -\cos\theta$ C) $\sin(\pi + \theta) = \sin\theta$
D) $\cos(\pi - \theta) = -\cos\theta$ E) NOTA

11. A party of hikers walks 8 km from camp on a bearing of $30°$ (off of North), then turns and walks 6 km on a course of $160°$. Find, to the nearest thousandth of a km., the magnitude of the net displacement from camp.

A) 5.144   B) 6.188   C) 10   D) 13.835   E) NOTA

12. Given $\triangle ABC$ with $m\angle A = 30°$, b = 12, and a = 8. Find all possible solutions for $m\angle B$ he nearest tenth.

A) $19.5°$ B) $41.4°$ C) $48.6°$ and $131.4°$ D) $48.6°$ E) NOTA

13. A vertical tree casts a shadow of 10 m at one time and 3.2 m at a later time, when the angle of the line of sight to the sun and the horizontal is doubled. Find the height of the tree.

A) 6 m   B) 6. 3 m   C) 9.5 m   D) 31.0 m   E) NOTA

14. Find the next term in the following harmonic sequence $\frac{1}{6}, \frac{1}{18}, \frac{1}{30}, \underline{\quad?\quad}$.

A) $\frac{1}{60}$ B) $\frac{1}{90}$ C) $\frac{1}{42}$ D) $\frac{1}{45}$ E) NOTA

15. Simplify the following expression to a single trigonometric function: $\dfrac{\sin 2\alpha}{\sin\alpha} - \dfrac{\cos 2\alpha}{\cos\alpha}$
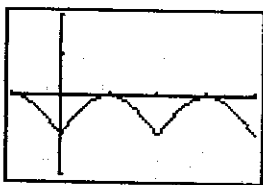
A) $\cos\alpha$ B) $\sec\alpha$ C) $\csc\alpha$ D) $\cos^2\alpha$ E) NOTA

16. If $\sin\alpha = \frac{3}{5}$ and $\cos\beta = -\frac{5}{13}$ where $90° < \alpha < 180°$ and $180° < \beta < 270°$. Find $\cos(\alpha - \beta)$.
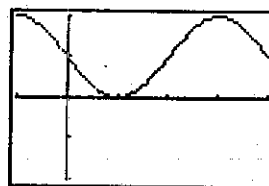
A) $-\frac{16}{65}$ B) $-\frac{56}{65}$ C) $\frac{16}{65}$ D) $\frac{56}{65}$ E) NOTA

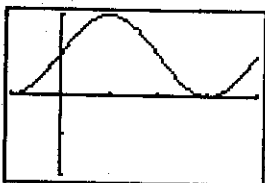17. Which of the following graphs is the graph of $y = |\sin x - 1|$.
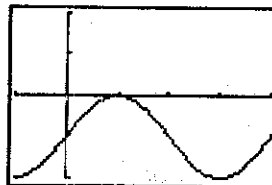
A)

B)

C)

D)

E) NOTA

18. Find the sum of the solutions of $\frac{1 - \cos x}{\sin x} = 1$, where $0 \le x < 2\pi$.

A) $\frac{\pi}{2}$　　　　B) π　　　　C) $\frac{3\pi}{2}$　　　　D) 2π　　　　E) NOTA

19. How many leaves does the graph $r = 3\cos 4\theta$ contain?
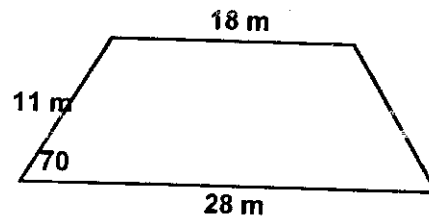
A) 3　　　　B) 4　　　　C) 6　　　　D) 8　　　　E) NOTA

20. Evaluate $\cos\left[\mathrm{Arc}\sin \frac{\sqrt{2}}{2} + \pi \right]$

A) $\frac{1}{2}$　　　　B) $-\frac{\sqrt{2}}{2}$　　　　C) $\frac{\sqrt{2}}{2}$　　　　D) $\frac{\sqrt{3}}{2}$　　　　E) NOTA

21. The sides of a triangle are 4, 8 and 6. Find the length of the altitude to the longest side (round to the nearest hundredth).

A) 2.90　　　　B) .36　　　　C) .97　　　　D) .12　　　　E) NOTA

22. To the nearest hundredth, find the area of the trapezoid shown.

A) 86.53
B) 173.06
C) 237.74
D) 475.48
E) NOTA

18 m

11 m

70

28 m

23. Consider 8 atheletes getting ready to run a 100-meter- dash race. If 3 of the athletes are clearly superior to the rest and are sure to be the top three, in how many ways can the race end?

A) 120　　　　B) 360　　　　C) 720　　　　D) 40,320　　　　E) NOTA

24. Solve $_{n+5}C_1 = _n C_2$. The third letter in the word for the number n is __?__.

A) e　　　　B) u　　　　C) v　　　　D) x　　　　E) NOTA

25. What is the 4th term of the expansion of $(2c - b)^{10}$?

A) $(2c)^7$

B) $(2c)^7(-b)^3$

C) $10 \bullet 9 \bullet 8(2c)^7(-b)^3$

D) $\frac{10 \bullet 9 \bullet 8}{3}(2c)^7(-b)^3$

E) NOTA

26. How many zeroes are at the end of 2000! ?

A) 400　　　　B) 496　　　　C) 499　　　　D) 1000　　　　E) NOTA

27. Find the area of the convex quadrilateral with vertices (3,0), (-2, 3), (7,5) and (-4, -1) .

A) 63　　　　B) 31.5　　　　C) 19　　　　D) 12.5　　　　E) NOTA

28. Evaluate: $\left(\left[(i^3+1)^4 + (i^3-1)^4 \right]^4 \right)^{\frac{1}{2}}$

    A) 0   B) $2i$ C) - 8   D) 64   E) NOTA

29. Express the polar equation $r^2 = \cos 2\theta$ as a cartesian equation.

    A) $(x^2+y^2)^2 = x-y$ B) $(x^2+y^2)^2 = x^2-y^2$ C) $(x^2+y^2)^3 = x^2-y^2$

    D) $(x^2+y^2)^3 = x^2+y^2+1$ E) NOTA

30. Point D is located in the interior of equilateral $\triangle ABC$. Perpendiculars are drawn to the three sides from D. If AB = 8, find the sum of the lengths of the perpendiculars.

    A) 4
    B) $8\sqrt{3}$
    C) $16\sqrt{3}$
    D) $4\sqrt{3}$
    E) NOTA