

MIAMI KILLIAN - MIAMI SUNSET INVITATIONAL JANUARY 9, 1993
PRECALCULUS INDIVIDUAL



1. If $5^x + 5^{x+3} = 15750$, then x equals:

- A. $\sqrt{3}$
- B. -3
- C. 25
- D. 3
- E. Answer not given

2. Find the equation of the line that is perpendicular to the line:

$$4x - 5y + 12 = 0$$

and passing through the point (5,2).

- A. $5x + 4y - 33 = 0$
- B. $4x - 5y - 10 = 0$
- C. $5x - 4y + 17 = 0$
- D. $4x + 5y - 30 = 0$
- E. Answer not given

3. Given the ellipse with the equation:

$$16x^2 + 4y^2 - 32x + 16y = 32$$

find the eccentricity of the ellipse.

- A. $2\sqrt{3}$
- B. $\sqrt{3}$
- C. $2\sqrt{5}$
- D. $\frac{\sqrt{3}}{2}$
- E. Answer not given

4. Find:

$$\sin(A + B) + \cos(A + B) - \sin(A - B) + \cos(A - B)$$

- A. $4\cos A \cos B$
- B. $2\cos A(\sin B + \cos B)$
- C. 0
- D. $4\cos A \sin B$
- E. Answer not given

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5. Which of the following is true for the graphs of $y = 2$ and $y = 2\sin x$, for $0 < x < \pi$?
- A. They intersect in one point.
 - B. They intersect in two points.
 - C. They intersect in three points.
 - D. They do not intersect.
 - E. Answer not given
6. Given that $a = 2,000$ and $b = 3,000$ and $\angle A = 30^\circ$, how many triangles exist?
- A. 0
 - B. 1
 - C. 2
 - D. Cannot be determined from the given information
 - E. Answer not given
7. A ship left harbor on a heading of 75° . After two hours the navigator observed that a lighthouse 70 miles due north of the harbor bore 300° from the ship. What was the speed of the ship in miles per hour?
- A. $\frac{140}{3}$
 - B. $\frac{35\sqrt{6}}{2}$
 - C. $\frac{280}{3}$
 - D. $\frac{35\sqrt{6}}{4}$
 - E. Answer not given
8. Find the sum of the lengths of the altitudes of $\triangle ABC$ given $A(3,4)$, $B(-2,4)$ and $C(1,0)$.
- A. 8
 - B. $8 - 2\sqrt{5}$
 - C. 4
 - D. $8 + 2\sqrt{5}$
 - E. Answer not given

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9. Evaluate:

$$\tan(\arccos \frac{3}{5} - \arcsin \frac{5}{13})$$

A. $-\frac{63}{16}$

B. $\frac{63}{16}$

C. $\frac{11}{12}$

D. $\frac{33}{56}$

E. Answer not given

10. What is the modulus and the argument of $8 + 8i$ respectively?

A. $16; 45^\circ$

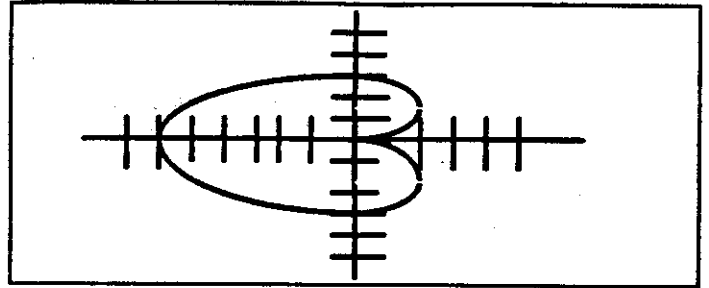
B. $64; 45^\circ$

C. $8\sqrt{2}; 90^\circ$

D. $8\sqrt{2}; 45^\circ$

E. Answer not given

11. Which of the following equation(s) has the polar graph shown?



I. $p = -3 - 3\cos \Theta$

II. $p = -3 + 3\cos \Theta$

III. $p = 3 - 3\cos \Theta$

IV. $p = 3 + 3\cos \Theta$

A. I only

B. II only

C. I and II only

D. I and III only

E. Answer not given

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12. A point P_1 is located at $(2,0)$ when P_2 is at $(1, \sqrt{3})$ on a circle of radius 2. P_1 and P_2 are moving with rotational velocities of

$\omega_1 = \frac{\pi}{3}$ and $\omega_2 = \frac{\pi}{4}$ respectively.

At what point will points P_1 and P_2 meet?

A. $(-1, -\sqrt{3})$

B. $(-\sqrt{3}, -1)$

C. $(\sqrt{2}, \sqrt{2})$

D. $(1, \sqrt{3})$

E. Answer not given

13. The polar graph of

$$p = 3\cos 2\theta$$

has how many petals?

A. 6

B. 2

C. 3

D. 4

E. Answer not given

14. If $\sin x = \frac{3}{5}$, find $\sin 2x$. $0 \leq x \leq \frac{\pi}{2}$

A. $\frac{24}{25}$

B. $-\frac{24}{25}$

C. $\frac{4}{5}$

D. $\frac{6}{5}$

E. Answer not given

15. $2\sin \frac{A+B}{2} \cos \frac{A-B}{2} =$

A. $\sin B + \sin A$

B. $\sin 2A$

C. $\sin \frac{A^2 - B^2}{2}$

D. $\cos A - \cos B$

E. Answer not given

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16. Which of the following functions has a domain of:

$$\{x \mid x \in \mathbb{R}, x \neq (2k+1)\pi, k \in \mathbb{J}\}$$

Note: \mathbb{J} is the set of integers

I. $\cos x$

II. $\tan x$

III. $\sec x$

IV. $\csc x$

A. I, II, and III only

B. I, II, and IV only

C. II, III, and IV only

D. I, III, and IV only

E. Answer not given

17. What is the period of:

$$y = -3\tan 2x + 1$$

A. $-\frac{\pi}{3}$

B. 2π

C. 3π

D. $\frac{\pi}{2}$

E. Answer not given

18. Find the cube roots of:

$$-16 - 16\sqrt{3}i$$

A. $2\sqrt[3]{4}cis 80, 2\sqrt[3]{4}cis 200, 2\sqrt[3]{4}cis 320$

B. $16cis 80, 16cis 200, 16cis 320$

C. $2\sqrt[3]{2}cis 80, 2\sqrt[3]{2}cis 200, 2\sqrt[3]{2}cis 320$

D. Cannot be determined

E. Answer not given

19. The equation:

$$3x^2 + 3y^2 - 7x + y = 0$$

has a locus that is a(n):

A. circle

B. ellipse

C. parabola

D. hyperbola

E. Answer not given:

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20. Work is defined as the force (F) exerted on an object (*in the direction of motion*) multiplied by the distance (D) the object is moved.

$$W = F \cdot D$$

Someone pulls on a box with a rope at an angle of 30° with a force of 50 N (Newtons). If the box moved 10 m, how much work is being done?

- A. 500
- B. $250\sqrt{2}$
- C. $250\sqrt{3}$
- D. 250
- E. Answer not given

21. If $z = 8 + 4i$, then what does

$\frac{1}{z}$ equal?

- A. $\frac{1}{8} + \frac{1}{4}i$
- B. $\frac{1}{10} - \frac{1}{20}i$
- C. $8 - 4i$
- D. $\frac{1}{8} + \frac{1}{4}i$
- E. Answer not given

22. Find all the values of x, if

$$0 \leq x \leq 2\pi$$

for: $\tan\left(\frac{\pi}{4} + 3x\right) = 2\tan(6x)$

- A. $\left\{\frac{\pi}{12}, \frac{5\pi}{12}, \frac{13\pi}{12}, \frac{17\pi}{12}\right\}$
- B. $\left\{\frac{\pi}{4}, \frac{5\pi}{4}\right\}$
- C. $\left\{\frac{3\pi}{4}, \frac{7\pi}{4}, \frac{9\pi}{4}\right\}$
- D. $\left\{\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}\right\}$
- E. Answer not given

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23. How many integers between 30 and 625 are divisible by 13?

- A. 49
- B. 45
- C. 50
- D. 46
- E. Answer not given

25. Find a scalar r and a vector v such that v is perpendicular to $(-2,4)$ and $r(-2,4) + v = (2,16)$.

- A. $r = 3, v = (8,4)$
- B. $r = 1, v = (4,2)$
- C. $r = 3, v = (4,8)$
- D. $r = 1, v = (2,16)$
- E. Answer not given

24. Evaluate:

$$\sin 60^\circ \cdot \cot 120^\circ \cdot \tan 60^\circ \cdot \sec 30^\circ$$

- A. 1
- B. -1
- C. $\frac{1}{2}$
- D. $\frac{\sqrt{3}}{2}$
- E. Answer not given

26. Evaluate: $(1 + \sqrt{3}i)^7$

- A. $64 + 64\sqrt{3}i$
- B. $64\sqrt{3} + 64i$
- C. $-64 + 64\sqrt{3}i$
- D. $-64\sqrt{3} + 64i$
- E. Answer not given

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27. Find the lowest integral upper bound of the equation:

$$3x^3 - 7x^2 - 21x + 54 = 0$$

- A. -3
B. 5
C. -5
D. 3
E. Answer not given

28. The voltage E in an electric circuit carrying alternating current can be described by $E = E_{\max}\sin(\omega t + b)$, where E is the voltage at time t and E_{\max} is the maximum voltage attained in one cycle. If the circuit is carrying a 120-cycle-per-second current, $b = 0$, and the maximum voltage is 80 volts, what is the

voltage in the circuit at $t = \frac{1}{320}$?

- A. .5 volts
B. 74 volts
C. $40\sqrt{2}$ volts
D. $50\sqrt{3}$ volts
E. Answer not given

29. What are the equations of the asymptotes for the graph of:

$$y = \frac{x^2 - 5}{x^2 - 9}$$

- A. $x = 3$ only
B. $x = \pm 3$ only
C. $y = 1$, $x = \pm 5$, and $x = \pm 3$ only
D. $y = 1$, and $x = \pm 3$ only
E. Answer not given.
30. From the point on the ground 500 feet away from the base of a house, the angle of elevation to the roof was 15° . What is the height of the house in feet?
- A. $1000 - 500\sqrt{3}$ feet
B. $\frac{250\sqrt{3}}{3}$ feet
C. $\frac{500\sqrt{3}}{3}$ feet
D. 250 feet
E. Answer not given