

Note: Figures not drawn to scale. NOTA denotes None Of The Above

- What is the equation of the line perpendicular to $2x + 3y = 4$ that passes through the point $(4, 7)$?

A) $2x - 3y = -13$ B) $3x - 2y = -2$
 C) $2x + 3y = 29$ D) $3x + 2y = 26$ E) NOTA
- Which of the following are even functions?

I. $f(x) = x^4 + 3x^2 + x + 1$ II. $f(x) = x^2 + 1$
 III. $f(x) = \cos x$ IV. $f(x) = x^6 - 3$

A) II, III, IV B) II, IV C) I, II, IV D) I, II, III, IV E) NOTA
- If $\cos(\theta + \alpha) = 2\cos^2(x) - 1$, express the angle x in terms of α and θ .

A) $x = \alpha + \theta$ B) $x = \frac{\alpha + \theta}{2}$ C) $x = 2(\alpha + \theta)$ D) $x = 4(\alpha + \theta)$ E) NOTA
- Find the 11th term in the geometric sequence $8, 4, 2, \dots$

A) 0 B) $\frac{1}{128}$ C) $\frac{1}{2}$ D) 13 E) NOTA
- Evaluate $\lim_{x \rightarrow 1} \left(\frac{x^4 - 1}{x^3 - 1} \right)$.

A) 0 B) 2 C) $\frac{4}{3}$ D) Does Not Exist E) NOTA
- For what value of k is the line $2x + ky = 3$ perpendicular to the line $3x + 8y = 1$?

A) $-\frac{16}{3}$ B) $-\frac{3}{4}$ C) $\frac{2}{3}$ D) $\frac{16}{3}$ E) NOTA

7. Solve $\frac{2x-5}{x-2} \leq 1$ $\{x : x \in \mathbb{R}\}$
A) $(-\infty, \infty)$ B) $(-\infty, 3]$ C) $[-\infty, 2) \cup [3, \infty)$ D) $(2, 3]$ E) NOTA
8. A cruise ship in the Caribbean Sea is 134 miles from one radio transmitter and 260 miles from another. The angle formed by the rays from the cruise ship to the transmitters measures 120° . Find the shortest distance between the radio transmitters. (Round to nearest tenth.)
A) 286.7 B) 346.9 C) 347.0 D) 394.0 E) NOTA
9. Find the eccentricity of an ellipse that has foci at $(1, 0)$ and $(0, 0)$ and a vertex at $(2, 0)$.
A) $\frac{1}{3}$ B) $\frac{3}{4}$ C) $\frac{3}{2}$ D) 3 E) NOTA
10. Find the acute angle between the vectors $\mathbf{u} = \mathbf{i} + 2\mathbf{j} - \mathbf{k}$ and $\mathbf{v} = \mathbf{i} + \mathbf{j}$.
A) $\frac{\pi}{6}$ B) $\frac{\pi}{4}$ C) $\frac{\pi}{3}$ D) $\frac{\pi}{2}$ E) NOTA
11. Find the coordinates of the focus of the parabola that has its vertex at the origin and its directrix defined by $x + y - 2 = 0$.
A) $\left(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$ B) $(-1, -1)$ C) $(1, 1)$ D) Cannot be Determined E) NOTA
12. Which of the following hold(s) true for the continuous function $y = f(x)$ at $x = c$:
I. $f(c)$ exists II. $\lim_{x \rightarrow c} f(x)$ exists III. $\lim_{x \rightarrow c} f(x) = f(c)$
A) I only B) II only C) II, III only D) I, II, III E) NOTA

13. Find $(1-i)^{12}$.

- A) -64 B) -1 C) 64 D) $64i$ E) NOTA

14. If $f(x) = x^2 + 2x + 1$ and $g(f(x)) = |x + 1|$, which of the following could be $g(x)$?

- A) $g(x) = |x + 1|$ B) $g(x) = x^2$
 C) $g(x) = \sqrt{x}$ D) $g(x) = x + 1$ E) NOTA

15. Angle C and Angle A are acute angles with $\cos(C) = \frac{3}{5}$ and $\cos(A) = \frac{5}{13}$. Find $\sin(C+A)$.

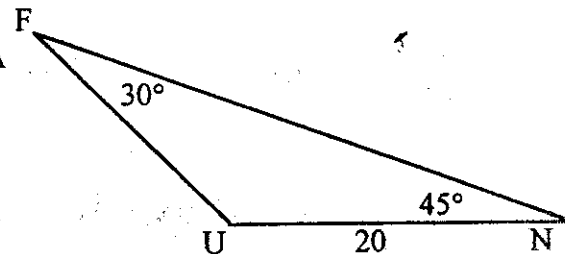
- A) $-\frac{16}{65}$ B) $\frac{33}{65}$ C) $\frac{56}{65}$ D) $\frac{63}{65}$ E) NOTA

16. If $f(x) = \sqrt{x}$ and $g(x) = \sqrt{1-x}$ what is the natural domain of $f(x) + g(x)$?

- A) $x \geq 0$ B) $x \leq 1$ C) $0 \leq x \leq 1$ D) $x \leq 0$ E) NOTA

17. In $\triangle FUN$, $UN = 20$, $\angle F = 30^\circ$, and $\angle N = 45^\circ$, find FN to the nearest tenth.

- A) 2.6 B) 6.0
 C) 10.3 D) 38.6 E) NOTA



18. Find the asymptotes of the equation $16y^2 - (x-3)^2 = 1$.

- A) $\pm \frac{1}{4} - \frac{3}{4}$ B) $y = \pm \frac{x}{4} - \frac{3}{4}$
 C) $y = \pm \frac{x}{16} - \frac{3}{4}$ D) $y = \pm 4x - \frac{3}{4}$ E) NOTA

19. Find $f(v(u(0)))$ given that $u(x) = 4x - 5$, $v(x) = x^2$ and $f(x) = \frac{1}{x}$.

- A) 0 B) $\frac{1}{25}$ C) $\frac{1}{5}$ D) Undefined E) NOTA

20. Find $\mathbf{u} \times \mathbf{v}$ given $\mathbf{u} = 4\mathbf{i} + 3\mathbf{j} + 4\mathbf{k}$ and $\mathbf{v} = 5\mathbf{i} - 2\mathbf{j} + 8\mathbf{k}$.

- A) 46 B) 41 C) $20\mathbf{i} - 6\mathbf{j} + 32\mathbf{k}$ D) $32\mathbf{i} - 12\mathbf{j} - 23\mathbf{k}$ E) NOTA

21. Find $19(x + y + z)$ given the following system;

$$3x + 2y - z = 2$$

$$12x - 4y - 3z = 38$$

$$2x + 5y - z = -8$$

- A) -650 B) 0 C) 152 D) $\frac{14516}{71}$ E) NOTA

22. Find the line that passes through the point $(-6, 4)$ and the point of intersection of the lines $x + 2y = 3$ and $2x - 3y = -1$.

- A) $3x - 5y = -2$ B) $x + 13y = 14$
 C) $3x + 7y = 10$ D) $5x + 3y = 8$ E) NOTA

23. Find the area of the triangle with vertices $A(0, 1, 0)$, $B(1, 2, 3)$, $C(1, 3, 2)$.

- A) $\frac{\sqrt{2}}{2}$ B) $\frac{\sqrt{5}}{2}$ C) $\frac{3\sqrt{2}}{2}$ D) $\frac{\sqrt{26}}{2}$ E) NOTA

24. If $f(x) = 4x + 3$ and $g(x) = 3x^2 + x$, then find $g(f(4)) - f(g(5) + f(3))$.

- A) 719 B) 764 C) 13002 D) 17252 E) NOTA

25. Find the Cartesian coordinates for the center of the polar equation $r = \sin \theta$.

- A) $(0, 0)$ B) $\left(0, \frac{1}{2}\right)$ C) $\left(3, -\frac{1}{2}\right)$ D) $(0, 2)$ E) NOTA

26. If $\lim_{x \rightarrow \infty} f(x) = 4$ and the $\lim_{x \rightarrow \infty} g(x) = 16$, then find $\lim_{x \rightarrow \infty} \frac{(f(x) + g(x)) - f(x)}{f(x)g(x)}$.

- A) -4 B) $-\frac{1}{4}$ C) $\frac{1}{4}$ D) Does Not Exist E) NOTA

27. Which of the following equations has a graph that is a parabola with vertex at $(2, -3)$ with directrix $x = 1$?

- A) $(x - 4)^2 = 4(y + 3)$ B) $4(x - 4)^2 = (y + 3)$
C) $(y + 3)^2 = 4(x - 2)$ D) $4(y + 3)^2 = (x - 2)$ E) NOTA

28. If $\log_a 7 = x$, $\log_a 5 = y$, and $\log_a 6 = z$, then express $\log_a \sqrt{\frac{1225}{36}}$ in terms of x , y , and z .

- A) $x + y - z$ B) $(xy) - z$ C) $x - y + z$ D) $x + y - 2z$ E) NOTA

29. Find the distance between the parallel planes $x + y + z = 0$ and $x + y + z = 1$.

- A) 0 B) $\frac{1}{2}$ C) $\frac{\sqrt{3}}{3}$ D) 1 E) NOTA

30. Which of the following equations has an eccentricity greater than 1?

- A) $(x + 1)^2 + (y - 4)^2 = 1$ B) $x^2 + 3x + y + 3 = 0$
C) $\frac{(x - 7)^2}{9} + \frac{(y + 2)^2}{16} = 1$ D) $\frac{x^2}{4} - \frac{y^2}{2} = 1$ E) NOTA