

Alpha Division
Multiple Choice Test

1. Solve for x : $|8-5x| > 6$

- a) $(-\infty, \frac{2}{5}) \cup (\frac{14}{5}, \infty)$ c) $(\frac{2}{5}, \frac{14}{5})$ e) N.O.T.
b) $(-\infty, \frac{2}{5}) \cap (\frac{14}{5}, \infty)$ d) $(\frac{2}{5}, \infty)$

2. Solve for k so that $(x-3)$ is a factor of $x^3 - kx^2 + 2x - 1$.

- a) $-\frac{22}{9}$ b) $-\frac{32}{9}$ c) $\frac{22}{3}$ d) $\frac{32}{3}$ e) N.O.T.

3. Find the distance between the points $(2, 60^\circ)$ and $(-3, 120^\circ)$.

- a) $\sqrt{7}$ b) $\sqrt{13}$ c) $\sqrt{19}$ d) 5 e) N.O.T.

4. Which of the following equations identify circles?

I $r = 5\sin\theta$ II $x^2 + 2y^2 = 4$ III $5x^2 + 5y^2 = 1$ IV $3x^2 + 3y^2 = 0$

- a) III only b) I and III c) I, III, and IV d) all e) N.O.T.

5. Given the function $x+xy-3y+2=0$, if x is real then y cannot be

- a) 3 b) 1 c) 0 d) -1 e) N.O.T.

6. A chessboard is an 8×8 grid. If a chessman is on the bottom left square, how many paths may he take to the top right square if he moves only up and to the right?

- a) 91 b) 3432 c) 6435 d) 12870 e) N.O.T.

7. A man is 7 miles south and 6 miles east of his home. A river is 3 miles south of his position. If the man must fetch some water from the river then return home, what is the least number of miles he may travel?

- a) $\sqrt{205}$ b) $3\sqrt{2} + \sqrt{109}$ c) $3 + 2\sqrt{34}$ d) $10 + 3\sqrt{5}$ e) N.O.T.

8. Simplify: ${}^5C_3 + {}^3P_2 - 4!$

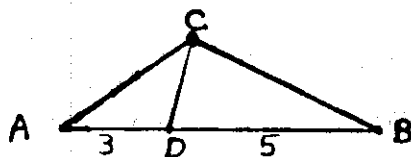
- a) -11 b) -8 c) 39 d) 42 e) N.O.T.

9. Simplify: $\sqrt{15 + 4\sqrt{14}}$

- a) $1 + \sqrt{14}$ b) $\sqrt{2} + \sqrt{14}$ c) $2\sqrt{2} + \sqrt{7}$ d) $\sqrt{2} + 2\sqrt{7}$ e) N.O.T.

10. Find the ratio of the area of $\triangle ACD$ to the area of $\triangle ABC$.

- a) 3:8 c) 9:64 e) N.O.T.
b) 3:5 d) 9:25



11. Which of the given values is not a solution of the equation

$$2\cos^2\theta + 2\cos\theta - \sqrt{3}\cos\theta - \sqrt{3} = 0 ?$$

- a) $\frac{\pi}{6}$ b) $\frac{5\pi}{6}$ c) π d) $\frac{11\pi}{6}$ e) N.O.T.

12. How many zeros does $45!$ end in?

- a) 7 b) 8 c) 9 d) 10 e) N.O.T.

13. How many quarts of pure alcohol must be added to 2 gallons of a 12% alcohol mixture in order to create a blend which is 20% alcohol?

- a) .02 b) .2 c) .8 d) 1.8 e) N.O.T.

14. How many times does the graph of the function $f(x) = 2x^8 - 3x^5 - 2x^3 - 2$ cross the x-axis?

- a) 0 b) 2 c) 4 d) 8 e) N.O.T.

15. Which of the given lines is an asymptote line for the graph of

$$y = \frac{x^2 - 3x + 5}{x - 2}$$

- a) $y = 0$ b) $x = -2$ c) $y = x - 1$ d) $y = x + 1$ e) N.O.T.

16. Identify the y-intercept of the graph $y = 6x^6 - 5x^5 + 4x^4 - 3x^3 + 2x^2 - x + 1$.

- a) (0,0) b) (0,-2) c) (0,6) d) (0,-1) e) N.O.T.

17. If $\cos x = \frac{3}{5}$, (where $0^\circ < x < 90^\circ$), find $\sin 2x$.

- a) $\frac{7}{25}$ b) $\frac{4}{5}$ c) $\frac{24}{25}$ d) $\frac{8}{5}$ e) N.O.T.

18. Evaluate: $3 + 2 + 1 + \frac{2}{3} + \frac{1}{3} + \frac{2}{9} + \frac{1}{9} + \frac{2}{27} \dots$

- a) 7.5 b) $7.6\bar{6}$ c) 8 d) 16.5 e) N.O.T.

19. Consider the following statements:

- I The eccentricity of a hyperbola is greater than one.
II The eccentricity of a parabola is equal to one.
III The eccentricity of an ellipse is less than one.

Which statement(s) is(are) always true?

- a) I only b) I and III c) I and II d) all e) N.O.T.

20. Simplify: $\frac{(\cos 50^\circ)(\sin 130^\circ)(\csc 200^\circ)(\sin 340^\circ)}{\sin 100^\circ}$

- a) $\frac{1}{2}$ b) $\frac{\sqrt{3}}{2}$ c) 1 d) 2 e) N.O.T.

21. Given the equation $\frac{y^2}{25} - \frac{x^2}{36} = 1$, which statement(s) is(are) true?

- I The point (0,5) is one y-intercept.
II The point $(0, \sqrt{61})$ is one focus.
III The line $y = 5x/6$ is one asymptote.
IV The point (6,0) is one x-intercept.

- a) I and II b) I and IV c) I, II and III d) I, II and IV e) N.O.T.

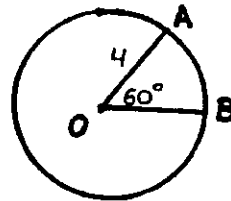
22. If $x^2 + y^2 = 20$ and $xy = 8$, then $|x^3 + y^3|$ is

- a) 24 b) 72 c) 216 d) 360 e) N.O.T.

23. Find the length of the tangent line drawn from the point (8,0) to the circle $x^2 + y^2 = 1$.

- a) 6 b) $2\sqrt{14}$ c) $3\sqrt{7}$ d) $\sqrt{65}$ e) N.O.T.

24. Given the circle to the right with center at O, find the length of arc AB.

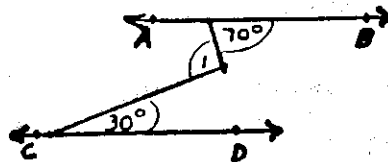


- a) $\frac{2\pi}{3}$ b) $\frac{4\pi}{3}$ c) $\frac{8\pi}{3}$ d) $\frac{32\pi}{3}$ e) N.O.T.

25. Express the vector $\vec{v}(2,-1)$ as a linear combination of $\vec{a}(2,3)$ and $\vec{b}(1,2)$.

- a) $5\vec{a} - 8\vec{b}$ b) $8\vec{a} - 5\vec{b}$ c) $5\vec{a} + 8\vec{b}$ d) $8\vec{a} + 5\vec{b}$ e) N.O.T.

26. If $AB \parallel CD$, find $m\angle 1$.



- a) 70° c) 90°
 b) 80° d) 100° e) N.O.T.

27. The sides of triangle ABC lie on the lines:
 $3x-4y=0$
 $4x+3y=0$
 $x=3$

Let (h,k) be the center of the circle inscribed in triangle ABC. Find $h + k$.

- a) 1.25 b) 1.5 c) 1.75 d) 2.25 e) N.O.T.

28. Find the area of an equilateral triangle whose side is 3.

- a) $9\sqrt{3}$ b) $\frac{9\sqrt{3}}{2}$ c) $\frac{9\sqrt{3}}{4}$ d) $\frac{9\sqrt{3}}{8}$ e) N.O.T.

29. If $2x-3y+4z=20$ and $3x-12y+9z= -2$, then $3x+3y+3z =$

- a) 54 b) 58 c) 62 d) 66 e) N.O.T.

30. When two runners run in opposite directions on a 440 yard track they meet every 50 seconds. When they run in the same direction they are abreast every 4 minutes 10 seconds. If $a =$ speed of the faster runner in yards per second and $b =$ speed of the slower runner in yards per second, then $a-b =$

- a) 1.76 b) 2.08 c) 5.28 d) 7.04 e) N.O.T.