# PSU MATH RELAYS 2017
## *Analytic Geometry*

Problems 1 – 23 are multiple choice. Place the letter of the correct answer in the appropriate space on the answer sheet. Choice (E) "a.n.g." represents "answer not given."

1. The midpoint of the segment joining $(3,-4)$ and $(-1,-1)$ is

(A) $\left(1,\dfrac{-5}{2}\right)$    (B) $(-3,4)$    (C) $(4,-3)$    (D) $\left(2,\dfrac{-3}{2}\right)$    (E) a.n.g.

2. Given the ellipse $\dfrac{(x+2)^2}{4}+\dfrac{(y-2)^2}{9}=1$ . What is the center of this ellipse?

(A) $(2,-2)$        (B) $(4,9)$        (C) $(-2,2)$        (D) $(2,3)$        (E) a.n.g.

3. The distance between $(3,-2,-1)$ and $(1,0,-2)$ is

(A) 3      (B) $\sqrt{5}$        (C) $\sqrt{29}$        (D) $3\sqrt{5}$        (E) a.n.g.

4. What center should a sphere of radius 5 have so that it sits on top of the point (4,6,-9)?

(A) $(4,-5,0)$        (B) $(4,6,-4)$        (C) $(9,11,-4)$        (D) $(4,6,1)$        (E) a.n.g.

5. The slope of every horizontal line is

(A) positive        (B) undefined        (C) $-1$        (D) 0        (E) a.n.g.

6. The equation of the line through $(2,-3)$ and $(-3,12)$ is

(A) $y=-15x+27$      (B) $x=-3$      (C) $y=-15x-1$      (D) $y=-9x+15$      (E) a.n.g.

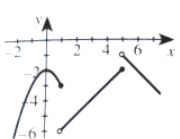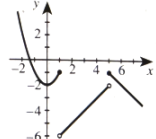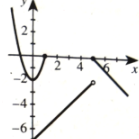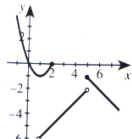7. The vertical asymptote of $f(x)=\dfrac{6x-2}{3-x}$ is

(A) $x=\dfrac{-2}{3}$        (B) $y=-6$        (C) $x=3$        (D) $y=6$        (E) a.n.g.

8. The horizontal asymptote of $f(x)=\dfrac{6x-2}{3-x}$ is

(A) $x=\dfrac{-2}{3}$        (B) $y=-6$        (C) $x=3$        (D) $y=6$        (E) a.n.g.

9. Another point on the line determined by $(2,-1)$ and $(-3,4)$ is

(A) (-1,3)        (B) (0,0)        (C) (10, -9)        (D) (-2, 1)        (E) a.n.g.

10. The graph of the system of equations $\begin{cases} 2x = y+7 \\ y = 2x+1 \end{cases}$ consists of two lines which

(A) are parallel     (B) intersect at $x = -1$     (C) intersect at $y = 2$     (D) coincide     (E) a.n.g.

11. Which of the following points lies on the curve $y = (1-x)^{2017}$ ?

(A) (1,1)     (B) (0,1)     (C) (0,-1)     (D) (0, 2017)     (E) a.n.g.

12. The set of all points in the plane 4 units from the $x$-axis is

(A) $x^2 + y^2 = 16$     (B) $xy = 4$     (C) $y = 4$     (D) $|y| = 4$     (E) a.n.g.

13. The center of $x^2 + y^2 - 6x + 14y - 6 = 0$ is

(A) (1, -2)     (B) (2, 4)     (C) (3, -7)     (D) $\left(-1, \dfrac{7}{3}\right)$     (E) a.n.g.

14. The radius of $x^2 + y^2 - 6x + 14y - 6 = 0$ is

(A) 8     (B) 6     (C) 64     (D) $\sqrt{6}$     (E) a.n.g.

15. The slope of any line perpendicular to $7x + 9y = 6$ is

(A) $-\dfrac{7}{9}$     (B) $\dfrac{9}{7}$     (C) $-\dfrac{6}{7}$     (D) 7     (E) a.n.g.

16. What is the equation of the slant asymptote for the graph of $y = \dfrac{2x^2 - 3x + 5}{x+2}$ ?

(A) $y = 2x - 3$     (B) $y = x + 2$     (C) $y = 2x$     (D) $y = 2x - 7$     (E) a.n.g.

17. What is the $x$-intercept of the graph of $y = \dfrac{1}{8}x^{3/2} - 8$ ?

(A) 16     (B) 512     (C) $\dfrac{1}{16}$     (D) $-4$     (E) a.n.g.

18. Which of the following is the graph of $f(x) = \begin{cases} x^2 - 2 & \text{for } x \le 1 \\ x - 7 & \text{for } 1 < x < 5 \\ 4 - x & \text{for } x \ge 5 \end{cases}$

(A)      (B)      (C)      (D)      (E) a.n.g.

19. How many $x$-intercepts does $y = x^2 - 2x + 7$ have?

(A) 3      (B) 2      (C) 1      (D) 0      (E) a.n.g.

20. The graph of the equation defined by $2x - 3 = y^2$ is a

(A) circle      (B) ellipse      (C) hyperbola      (D) parabola      (E) a.n.g.

21. The $x$-coordinate of the point of intersection of the graphs of $13x + 7y = -8$ and $5x = 2y + 11$ is

(A) $-\dfrac{8}{11}$      (B) 2      (C) $-3$      (D) 1      (E) a.n.g.

22. The center of $2x^2 + y^2 - 16x + 4y + 6 = 0$ is

(A) (4, -2)      (B) (2, 4)      (C) (-8, 4)      (D) $\left( -\dfrac{8}{5}, \dfrac{4}{5} \right)$      (E) a.n.g.

23. If the equation $x^2 - y^2 = 1$ were graphed in the standard coordinate plane, the graph would be a

(A) parabola      (B) hyperbola      (C) ellipse      (D) circle      (E) a.n.g.

24. The slope-intercept form of the equation of the line perpendicular to $5x - 3y = 4$ and passing through (3, -4) is ____?____ .

25. Give the equation in general form $x^2 + y^2 + Ax + By + C = 0$ of a circle with center (-3, 2) and radius of 4.