Name:_____Period:____Date:_____

NON-CALCULATOR SECTION

Vocabulary: Define each word and give an example.

1. parabola

2. semimajor axis (of an ellipse)

3. eccentricity

Short Answer:

4. Explain what the discriminant is and how it determines what time of conic section is represented by an equation.

5. Describe how to determine what type of conic is represented by an equation of the form $r = \dfrac{a}{b + c\cos\theta}$.
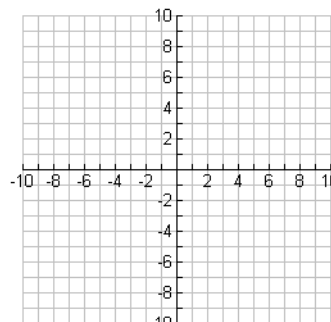
Review:

6. Find the partial fraction decomposition. $\dfrac{2x}{x^2 + 2x - 3}$

7. Find the rectangular coordinates of the point with the given polar coordinates.
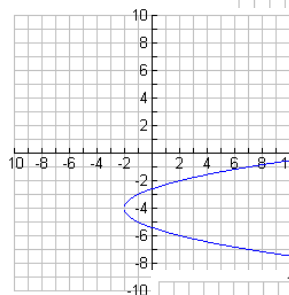$\left(-2, 150°\right)$

Problems:
Be sure to show all work used to obtain your answer. Circle or box in the final answer.
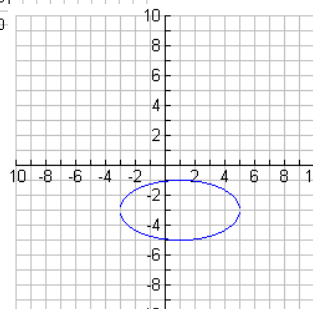
8. Graph the ellipse:
$$(x-1)^2 + 64(y+3)^2 = 16$$
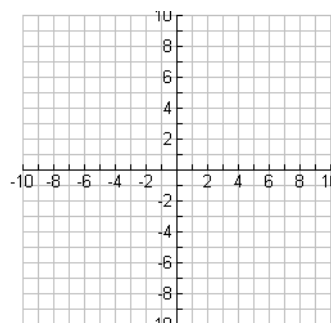
9. Write an equation for the graph.

10. Write an equation in standard form for the conic shown:

11. Identify the conic. Complete the square to write the conic in standard form and then sketch the graph.

$$9x^2 + 4y^2 - 18x + 8y - 23 = 0$$

12. Use the discriminant to decide whether the equation represents a parabola, ellipse or hyperbola.

   a. $-3x^2 + 7xy - 2y^2 - 2x + 3y - 10 = 0$ b. $5xy - 6y^2 + 10x - 17y + 20 = 0$

13. Find the new coordinates of the given point when the *xy*-coordinate system is rotated by the indicated angle.

$$P(x, y) = (2, -3); \ \alpha = \frac{3\pi}{4}$$

14. What type of conic is the graph of $r = \dfrac{6}{1 + 2\cos\theta}$?

15. Find the directrix, eccentricity, and type of conic with polar form:

$$r = \frac{4}{2 - \sin\theta}$$

16. Find the polar equation of the conic with focus at the pole, eccentricity 5/4 and directrix $x = 4$.

17. Find the midpoint of the segment *PQ*.

$$P(6, -1, 7), Q(4, -2, -8)$$

Evaluate the expressions. Let $\mathbf{r} = \langle 1, -3, -2 \rangle$, $\mathbf{v} = \langle 4, 5, -3 \rangle$, $\mathbf{w} = \langle 3, -2, -1 \rangle$

18. $\mathbf{r} - \mathbf{v}$

19. $(\mathbf{r} + \mathbf{v}) \cdot w$

20. Compute the magnitude of $\mathbf{w}$.

21. Write the unit vector in the direction of $\mathbf{v}$.

Name:_____Period:____Date:_____

CALCULATOR SECTION

22. Find the vertex, focus, directrix, and focal width of the parabola.
$$(y+2)^2 = -8(x+1)$$

23. Find an equation in standard form for the ellipse with major axis from $(-2,-1)$ to $(-2,7)$ and foci at $(-2,1)$ to $(-2,5)$.

24. Find an equation in standard form for the hyperbola whose transverse axis has endpoints $(-7,3),(5,3)$ and whose conjugate axis has length 10.

25. Find the equation for the conic in standard form and identify the conic section.
$$x = -2 + 3\cos t \quad y = 5 + 7\sin t, \ 0 \le t \le 2\pi$$

26. Solve for y, and use your calculator to graph the conic.
$$xy - y - 8 = 0$$
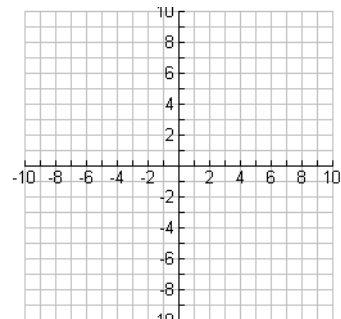
27. Solve for y. Write your answer in simplest form. $-x^2 + 3xy + 4y^2 - 5x - 10y - 20 = 0$

28. Find the values of e, a, b, and c. Then identify the type of conic.

$$r = \frac{16}{5 + 3\cos\theta}$$

29. Find a polar equation for an ellipse with a focus at the pole and major axis endpoints $(-3, 0)$ and $(1.5, \pi)$.

30. Find the distance between the points $P(2, -1, -8)$ and $Q(6, -3, 4)$

31. Find the equation representing the sphere with center $(-1, 5, 8)$ and radius $\sqrt{5}$.

32. Write the vector and parametric form of the equation for the line through the points $A(-1, 2, 4)$ and $B(0, 6, -3)$.