Precalculus Workbook

Conic sections and analytic geometry

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MATH

IDENTIFYING CONIC SECTIONS

■ 1. Identify the equation as a circle, ellipse, parabola, or hyperbola.

$$5y^2 - 2 = x + 3y + 6$$

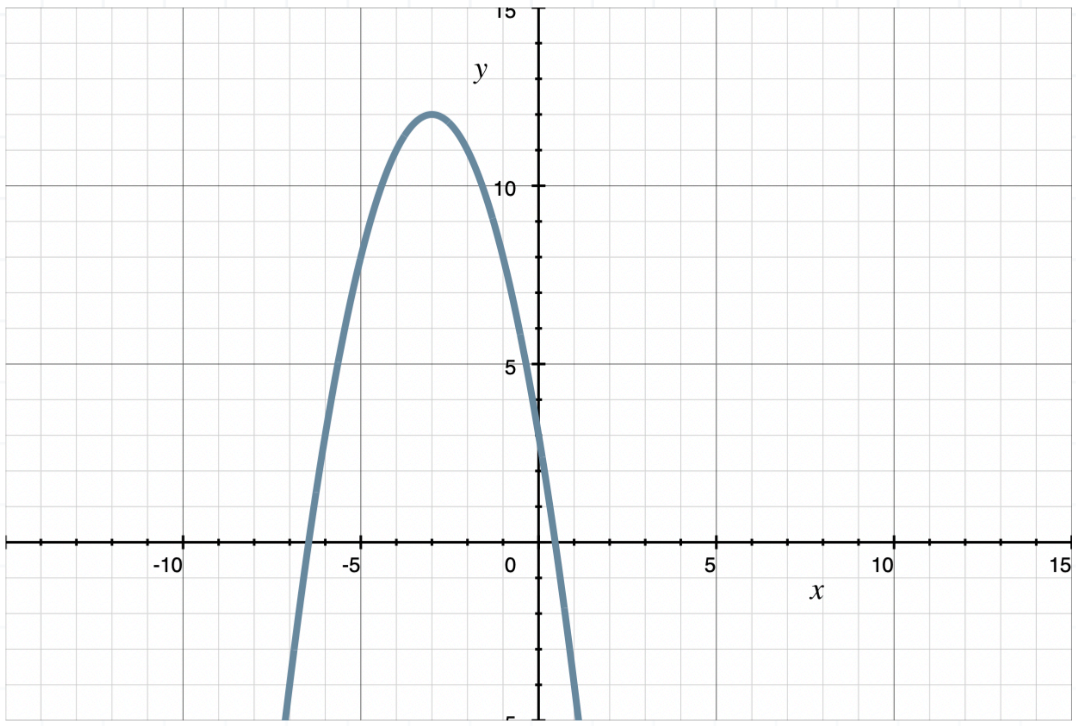
■ 2. Identify the equation as a circle, ellipse, parabola, or hyperbola.

$$x^2 - 5x + 2y = 1 - y^2$$

■ 3. Identify the equation as a circle, ellipse, parabola, or hyperbola.

$$8y^2 - 9x + 2y = -2x^2 + 6$$

■ 4. Identify the graph as a circle, ellipse, parabola, or hyperbola.



■ 5. Identify the equation as a circle, ellipse, parabola, or hyperbola.

$$11x + 12y^2 - 2 = 9y - 12x^2 + 15$$

■ 6. Identify the equation as a circle, ellipse, parabola, or hyperbola.

$$-5x + 14y - 4x^2 = 25 - 2y^2$$

CIRCLES

■ 1. If the center of a circle is $(-4,1)$ and a point on the circle is $(0,-2)$, find the equation of the circle.

■ 2. If the center of a circle is $(7,-2)$ and a point on the circle is $(10,-4)$, find the equation of the circle.

■ 3. Graph the circle.

$$(x-1)^2+(y+9)^2=49$$

■ 4. Find the center and radius of the circle.

$$(x-7)^2+(y+11)^2=18$$

■ 5. Find the center and radius of the circle.

$$x^2+y^2-4x-2y+1=0$$

■ 6. Find the center and radius of the circle.

$$x^2 + y^2 + 12x - 26y + 173 = 0$$

ELLIPSES

■ 1. Sketch the graph of the ellipse by finding its center and major and minor radii.

$$\frac{(x-4)^2}{9}+\frac{(y-3)^2}{25}=1$$

■ 2. Sketch the graph of the ellipse by finding its center and major and minor radii.

$$\frac{(x-6)^2}{9}+\frac{(y+4)^2}{4}=1$$

■ 3. Find the coordinates of the foci of the ellipse.

$$\frac{(x+7)^2}{4}+\frac{(y+6)^2}{20}=1$$

■ 4. Find the coordinates of the foci of the ellipse.

$$\frac{(x-3)^2}{8}+\frac{(y-6)^2}{5}=1$$

5. Sketch the graph of the ellipse.

$$x^2 - 12y + 37 = 6 - 3y^2 - 10x$$

6. Sketch the graph of the ellipse.

$$14y - 24x + 85 = 16 - 4x^2 - y^2$$

PARABOLAS

■ 1. Find the equation of the parabola with a focus at $(-1,9)$ and a directrix at $y=7$.

■ 2. Find the equation of the parabola with a focus at $(3,-7)$ and a directrix at $y=-3$.

■ 3. Find the focus and directrix of the parabola.

$$y=x^2-3$$

■ 4. Find the focus and directrix of the parabola.

$$y=-\frac{1}{3}(x-1)^2+2$$

■ 5. Find each piece of the parabola from its equation.

$$y=\frac{1}{2}x^2+4$$

6. Find each piece of the parabola from its equation.

$$x = -\frac{2}{3}(y+2)^2 + 1$$

HYPERBOLAS

■ 1. Find the asymptotes, foci, vertices, and directrices of the hyperbola.

$$\frac{y^2}{4} - \frac{x^2}{25} = 1$$

■ 2. Find the asymptotes, foci, vertices, and directrices of the hyperbola.

$$\frac{x^2}{4} - \frac{y^2}{81} = 1$$

■ 3. Find the asymptotes, foci, vertices, and directrices of the hyperbola.

$$\frac{(y-3)^2}{36} - \frac{(x+2)^2}{9} = 1$$

■ 4. Find the asymptotes, foci, vertices, and directrices of the hyperbola.

$$\frac{(x+1)^2}{25} - \frac{(y+4)^2}{144} = 1$$

■ 5. Sketch the graph of the hyperbola.

$$\frac{y^2}{16} - \frac{x^2}{4} = 1$$

■ 6. Sketch the graph of the hyperbola.

$$\frac{(x+1)^2}{2} - \frac{(y-1)^2}{12} = 1$$

ROTATING AXES

■ 1. Find the angle of rotation of the conic.

$$3x^2 + 2xy + y^2 - y - 12 = 0$$

■ 2. Find the vertex of the parabola.

$$x^2 + 2xy + y^2 = 2x - 2y + 4$$

■ 3. Sketch the graph of $x^2 + \sqrt{3}xy = 1$.

■ 4. Find foci of the conic.

$$2x^2 - 4xy + 5y^2 - 4x - 8y + 8 = 0$$

■ 5. Use the discriminant to determine the shape of the conic.

$$-2x^2 - xy - y^2 + 4x + y + 3 = 0$$

■ 6. Use the discriminant to determine the shape of the conic.

$$25x^2 + 30xy + 9y^2 - 12x - 8 = 0$$

POLAR EQUATIONS OF CONICS

■ 1. A hyperbola has vertices at $(2,-1)$ and $(2,3)$, directrices $y=0$ and $y=2$, and foci at $(2,5)$ and $(2,-3)$. Find the eccentricity of hyperbola.

■ 2. Find the eccentricity of the conic.

$$\frac{(x+1)^2}{4}-\frac{(y-1)^2}{32}=1$$

■ 3. Find the foci of the ellipse.

$$r=\frac{5}{3-2\cos\theta}$$

■ 4. A conic has a focus at $(0,0)$ with a corresponding directrix of $y=-5$ that passes thought the point $(5,0)$. Write the conic equation in polar coordinates.

■ 5. Determine the shape of the conic section.

$$r=\frac{10}{6+4\cos\theta}$$

■ 6. Find the equation of the conic section that has eccentricity $e = 5/4$, directrix $x = -2$, and is rotated by $\alpha = \pi/3$.

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