

1. Find the vertex, focus, directrix, and focal diameter of the parabola, and sketch its graph.

$$x - \frac{1}{2}y^2 = 0$$

2. Find the vertices, foci, and eccentricity of the following ellipse, determine the lengths of the major and minor axes, and sketch its graph.

$$9x^2 + 4y^2 = 36$$

3. Determine whether the equation represents a parabola, an ellipse, or a hyperbola. If the graph is a parabola, find the vertex, focus, directrix, and focal diameter. If it is an ellipse, find the center, foci, vertices, lengths of the major and minor axes, and eccentricity. If it is a hyperbola, find the center, foci, vertices, and asymptotes. Then sketch the graph of the equation.

$$x^2 - y^2 = 10x - 10y + 1$$

4. Find an equation for the ellipse that satisfies the given conditions.

Foci:  $(\pm 5, 0)$ , length of major axis: 12

5. Find an equation for the hyperbola that satisfies the given conditions.

Vertices:  $(0, \pm 6)$ , asymptotes:  $y = \pm \frac{1}{3}x$

Q: When can you add two to eleven and get one as the correct answer?

6. Determine whether the equation represents a parabola, an ellipse, or a hyperbola. If the graph is a parabola, find the vertex, focus, directrix, and focal diameter. If it is an ellipse, find the center, foci, vertices, lengths of the major and minor axes, and eccentricity. If it is a hyperbola, find the center, foci, vertices, and asymptotes. Then sketch the graph of the equation.

a)  $\frac{1}{2}x^2 - 2y = 0$

b)  $2x + 3y^2 = 0$

c)  $x^2 - 2x = -6y - 1$

d)  $8x - 12 = y^2 + 4y$

e)  $5x^2 + 9y^2 = 45$

f)  $8x^2 = 4 - y^2$

g)  $4x^2 + y^2 - 8x + 6y + 9 = 0$

h)  $x^2 + 6x + 4y^2 - 16y = -9$

i)  $x^2 = 36y^2 + 9$

j)  $y^2 - 2x^2 - 4 = 0$

k)  $9y^2 + 18y - x^2 - 4x = 4$

l)  $25x^2 - 4y^2 - 150x + 125 = 0$

7. Find an equation for the parabola that satisfies the given conditions.

Focus:  $(-2, 1)$ , directrix:  $x = 1$

8. Find an equation for the parabola that satisfies the given conditions.

Vertex:  $(4, -2)$ , focus:  $(6, -2)$

9. Find an equation for the ellipse that satisfies the given conditions.

Foci:  $(0, \pm 1)$ , vertices:  $(0, \pm 2)$

10. Find an equation for the ellipse that satisfies the given conditions.

Foci  $(1, 2)$  and  $(-3, 2)$ , vertex:  $(-4, 2)$

11. Find an equation for the hyperbola that satisfies the given conditions.

Vertices:  $(\pm 3, 0)$ , asymptotes:  $y = \pm \frac{1}{2}x$



12. Find an equation for the hyperbola that satisfies the given conditions.

Center:  $(-2, 2)$ , vertex:  $(-2, 5)$ , focus:  $(-2, 2 + \sqrt{13})$

Optional exercises from the Sullivan book if you'd like more practice:

10.2 (p.646) #13-55 odd

10.3 (p.656) #13-63 odd

10.4 (p.669) #15-35 odd, 41-61 odd