1. Calculate the distance of these points to the origin. Plot them.

$$d = \sqrt{x^2 + y^2}$$

(0, 1)	$(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2})$	$(\frac{1}{2}, \frac{\sqrt{3}}{2})$
(0, -1)	$(\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2})$	$(\frac{1}{2}, -\frac{\sqrt{3}}{2})$
(1, 0)	$(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2})$	$(-\frac{1}{2}, \frac{\sqrt{3}}{2})$
(-1, 0)	$(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2})$	$(-\frac{1}{2}, -\frac{\sqrt{3}}{2})$

2. Plot this equation with a computer. What is the distance of all its points to the origin?

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

3. Is the equation from problem #2 a function? Solve for y and plot on a computer.

4. Plot the circles on a computer to determine what the parameters r, h, and k represent graphically.

$$r^2 = (x-h)^2 + (y-k)^2$$

$1^2 = (x - 0)^2 + (y - 0)^2$

$2^2 = (x - 0)^2 + (y - 0)^2$ $\quad 1^2 = (x - 2)^2 + (y - 0)^2$ $\quad 1^2 = (x - 0)^2 + (y - 2)^2$

$3^2 = (x - 0)^2 + (y - 0)^2$ $\quad 1^2 = (x - 4)^2 + (y - 0)^2$ $\quad 1^2 = (x - 0)^2 + (y - 4)^2$

$4^2 = (x - 0)^2 + (y - 0)^2$ $\quad 1^2 = (x + 2)^2 + (y - 0)^2$ $\quad 1^2 = (x - 0)^2 + (y + 2)^2$

$5^2 = (x - 0)^2 + (y - 0)^2$ $\quad 1^2 = (x + 2)^2 + (y - 0)^2$ $\quad 1^2 = (x - 0)^2 + (y + 4)^2$

5. Plot the circles on a computer. Write them in standard form.

$$1 = \frac{x^2}{1} + \frac{y^2}{1} \qquad 1 = \frac{x^2}{4} + \frac{y^2}{4} \qquad 1 = \frac{x^2}{9} + \frac{y^2}{9} \qquad 1 = \frac{x^2}{16} + \frac{y^2}{16}$$

6. Plot the on a computer. What are the major/minor axis lengths?

$$1 = \frac{x^2}{1} + \frac{y^2}{4} \qquad 1 = \frac{x^2}{4} + \frac{y^2}{1} \qquad 1 = \frac{x^2}{9} + \frac{y^2}{4} \qquad 1 = \frac{x^2}{1} + \frac{y^2}{16}$$

7. Plot the ellipses on a computer to determine what the parameters a, b, h, and k represent graphically.

$$1 = \frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2}$$

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

$$1 = \frac{(x-0)^2}{2^2} + \frac{(y-0)^2}{1^2} \qquad 1 = \frac{(x-0)^2}{3^2} + \frac{(y-0)^2}{1^2} \qquad 1 = \frac{(x-0)^2}{4^2} + \frac{(y-0)^2}{1^2}$$

$$1 = \frac{(x-0)^2}{1^2} + \frac{(y-0)^2}{2^2} \qquad 1 = \frac{(x-0)^2}{1^2} + \frac{(y-0)^2}{3^2} \qquad 1 = \frac{(x-0)^2}{1^2} + \frac{(y-0)^2}{4^2}$$

$$1 = \frac{(x-0)^2}{2^2} + \frac{(y-0)^2}{1^2} \qquad 1 = \frac{(x-5)^2}{3^2} + \frac{(y-0)^2}{1^2} \qquad 1 = \frac{(x+6)^2}{4^2} + \frac{(y-0)^2}{1^2}$$

$$1 = \frac{(x-0)^2}{1^2} + \frac{(y-0)^2}{2^2} \qquad 1 = \frac{(x-0)^2}{1^2} + \frac{(y-5)^2}{3^2} \qquad 1 = \frac{(x-0)^2}{1^2} + \frac{(y+6)^2}{4^2}$$

8. On the computer, plot an ellipse with:

a) width = 2, height = 4, center at (2, 3)
b) width = 4, height = 6, center at (2, 3)
c) $2\sqrt{2}$ units wide, 4 units tall, center at ($-\sqrt{2}$, -2)
d) 2 units wide, 1 unit tall, center at (-1, ½)

9. Plot. What happens to the function when the denominator is zero?

$f(x) = \frac{1}{x}$ $f(x) = \frac{1}{x-5}$ $f(x) = \frac{1}{x+5}$

$f(x) = -\frac{1}{x}$ $f(x) = -\frac{1}{x-5}$ $f(x) = -\frac{1}{x+5}$

$f(x) = \frac{1}{x^2}$ $f(x) = \frac{1}{(x-5)^2}$ $f(x) = \frac{1}{(x+5)^2}$

$f(x) = -\frac{1}{x^2}$ $f(x) = -\frac{1}{(x-5)^2}$ $f(x) = -\frac{1}{(x+5)^2}$

$f(x) = \frac{1}{x^3}$ $f(x) = \frac{1}{(x+5)(x-5)}$ $f(x) = \frac{1}{x(x+5)(x-5)}$

10. What is the limiting and asymptotic behavior? Freehand below.

$f(x) = \frac{1}{x}$ $f(x) = -\frac{1}{x}$

11. Plot the hyperbolas and lines with slope $\pm\frac{b}{a}$ on a computer.

$$1 = \frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2}$$

a) $1 = \frac{(x-0)^2}{2^2} - \frac{(y-0)^2}{3^2}$ with $y = \pm\frac{3}{2}x$

b) $1 = \frac{(x-0)^2}{3^2} - \frac{(y-0)^2}{4^2}$ with $y = \pm\frac{4}{3}x$

c) $1 = \frac{(x-0)^2}{5^2} - \frac{(y-0)^2}{6^2}$ with $y = \pm\frac{6}{5}x$

12. Plot the hyperbolas and lines with slope $\pm\frac{b}{a}$ on a computer.

$$1 = \frac{(y-k)^2}{b^2} - \frac{(x-h)^2}{a^2}$$

a) $1 = \frac{(y-0)^2}{3^2} - \frac{(x-0)^2}{2^2}$ with $y = \pm\frac{3}{2}x$

b) $1 = \frac{(y-0)^2}{4^2} - \frac{(x-0)^2}{3^2}$ with $y = \pm\frac{4}{3}x$

c) $1 = \frac{(y-0)^2}{6^2} - \frac{(x-0)^2}{5^2}$ with $y = \pm\frac{6}{5}x$