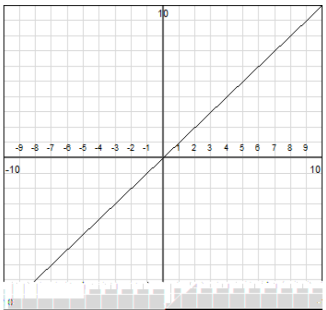
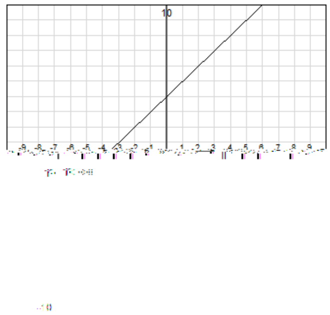
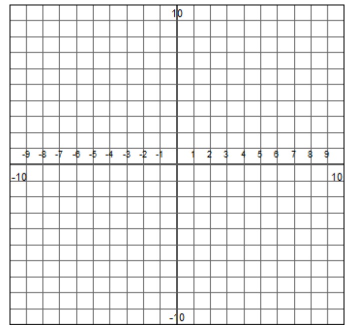
When we teach linear equations in Algebra1, we teach the simplest linear function (the mother function) as . We then usually lead to the understanding of the effects of the slope and the y-intercept on the original. Let's focus on the point on the origin.







The shifting that can occur to the point that was on the origin is a combination of a horizontal shift and a vertical shift. We could write the equation of the second graph as $=$ showing the vertical shift as +4 and the horizontal shift as 0. Instead, we write $= \; +4$.

What would the equation be of the linear function that passes through the point in the third graph with slope=1? If the point is the vertical shift in the origin of +6 and the horizontal shift of +2, we could write $!6 = \; !2$, which of course simplifies to However, if we did teach $y \quad k = m \; x \quad h$ form, thv4 831 (83 .0 146 (4) 16i) 5(p) o (i) 2 83 .0 1

Conics (Completing the square to find the standard form of conics):

The general form of a shifted conic is $A\ ^2 + C\ ^2 + \quad + \quad + \quad = 0$ (both A and C ! 0).

If A or C = 0, then the conic is a parabola.

If A and C have the same sign, then the conic is an ellipse. If A=C, then the conic is a circle.

If A and C have opposite signs, then the conic is a hyperbola.

Transformi( ).

Graph as before with $V(5,-2)$

= !

= !

You try #1: Transform into standard form and determine the conic:

−

$$2x^2 + 4x \quad + y^2 + 2y \quad = 6$$

$$2(x^2 + 2x + 1) + (y^2 + 2y + 1) = 6 + 2 + 1$$

$$2(x+1)^2 + \left(y+1\right)^2 = 9$$

$$\frac{2(x+1)^2}{9} + \frac{\left(y+1\right)^2}{9} = 1$$

$$\frac{(x+1)^2}{\frac{9}{2}} + \frac{\left(y+1\right)^2}{9} = 1$$

You try #2: Transform into standard form and determine the conic:

\+ − − + =

$$4\;\;^2\;\;8\;\;+9\;\;^2\;\;54\;\;=\;\;49$$

$$4(\;\;^2\;\;2\;\;+1)+9(\;\;^2\;\;6\;\;+9) = \;\;49+4+81$$

$$4(\;\;\;1)^2 + 9\left(\;\;\;3\right)^2 = 36$$

$$\frac{4(\;\;\;1)^2}{36} + \frac{9\left(\;\;\;3\right)^2}{36} = \frac{36}{36}$$

$$\frac{(\;\;\;1)^2}{\frac{9}{2}} + \frac{\left(\;\;\;3\right)^2}{4} = 1$$

Example 3: Transform into standard form and determine the conic:

−

You try #3: Transform into standard form and determine the conic:

$$4x^2 + y^2 \; ! \; 8x + 2y + 8 = 0$$

! !

! !

! ! !

This is degenerate so therefore has no solution. The sum of two squares will never be negative.

Example 4: Transform into standard form and determine the conic:

$$9\;\;^2 - \;\;^2 + 18\;\; + 4\;\; + 5 = 0$$

$$+ \quad + \; - \quad - \quad + \quad = - \; + \; -$$

$$+ \quad -(\; - \;) \; =$$

Degenerate, however since it is subtraction, we can attempt to solve.

$$9(\;\; +1)^2 = (\;\;\; 2)^2$$

$$\pm\sqrt{9(\;\; +1)^2} = \pm\sqrt{(\;\;\; 2)^2}$$

$$\pm 3(\;\; +1) = \;\;\; 2$$

$$= 2 \pm 3(\;\; +1)$$

$$2 \;\; 3(\;\;\; 1)$$

$$2 \;\; 3(\;\;\; 1) \quad \text{or} \quad 2 - 3(\;\;\; 1)$$

$$2 \;\; 3 \;\;\; 3 \quad \text{or} \quad 2 - 3 \;\; -3$$

$$3 \;\;\; 5 \quad \text{or} \quad -3 \;\; -1$$

This examples graphs out to be two lines.