Sec. 9.5 Parametric Equations

Parametric Equations: equations that express both x and y as functions of t (time). Parametric equations of a line are useful in finding the times and positions at which an object moving with constant velocity crosses a curve (line, etc…) whose equation is known. They are useful for modeling the path of an object.

The parameter, t, will allow us to compute points.

The set of ordered pairs (x, y) that are generated from the parametric equations is called a **Plane Curve**.

Graphing a plane curve represented by parametric equations involves plotting points in the rectangular coordinate system and connecting them with a smooth curve.

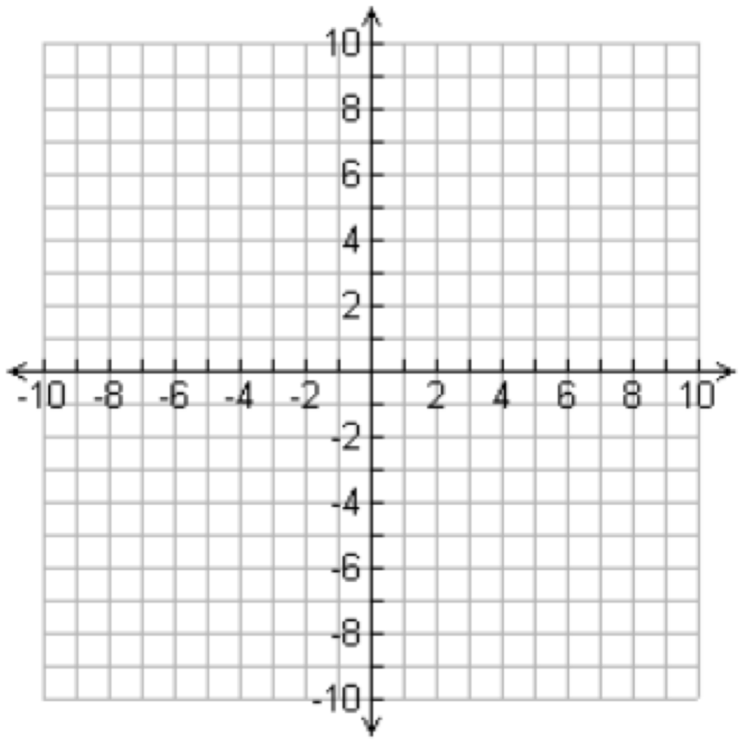
The points should be plotted in the order of increasing t values. This will tell us the direction, or ***orientation*** of the curves as t increases. We use **arrows** between the points to **show the orientation** of the curve corresponding to increasing values of t.

The process of **eliminating the parameter** finds a rectangular equation (an equation in terms of x and y) that has the same curve as the parametric equations.

Sketch the curve represented by the parametric equations and write the corresponding rectangular equation by eliminating the parameter.

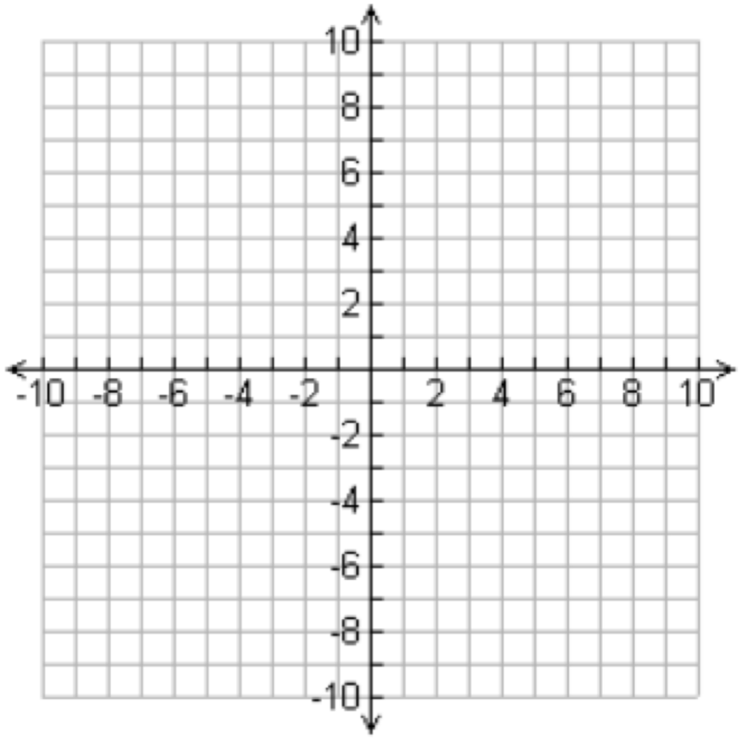
Ex.1: $x = t - 1$

$y = t^2$



Ex.2: $x = 3 - 2t$

$y = 2 + 3t$

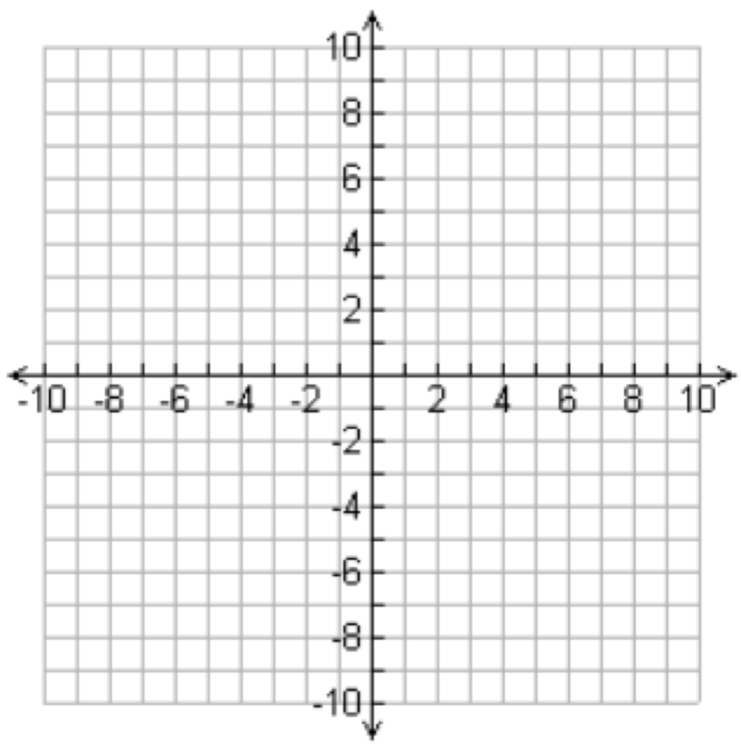


Caution: when converting from parametric to rectangular form, the range of x and y implied by the parametric equations may be altered by the change of the rectangular form.

So…you may need to change the domain of the rectangular equation to be consistent with the domain for the parametric equation in x.

Ex.3: $x = \sqrt{t}$

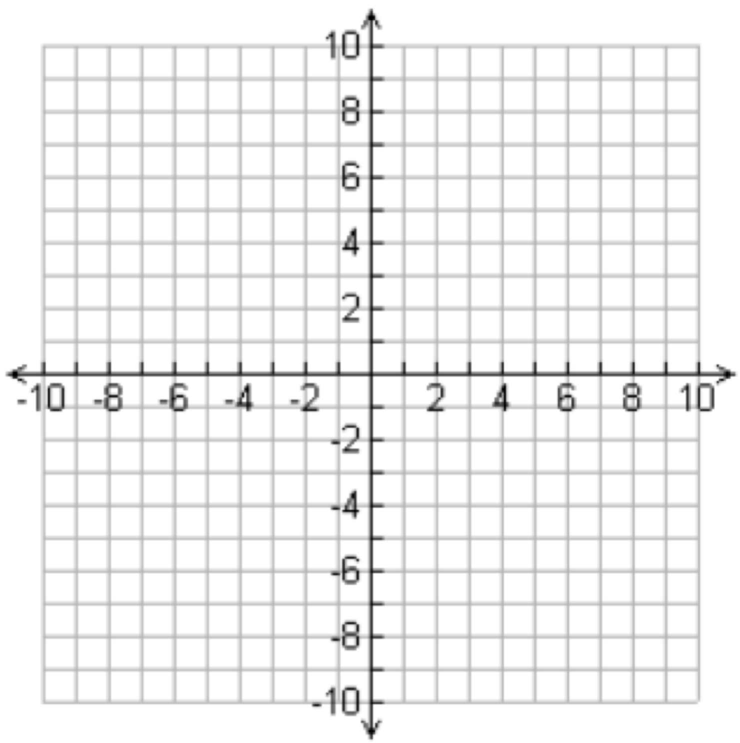
$y = 1 - t$



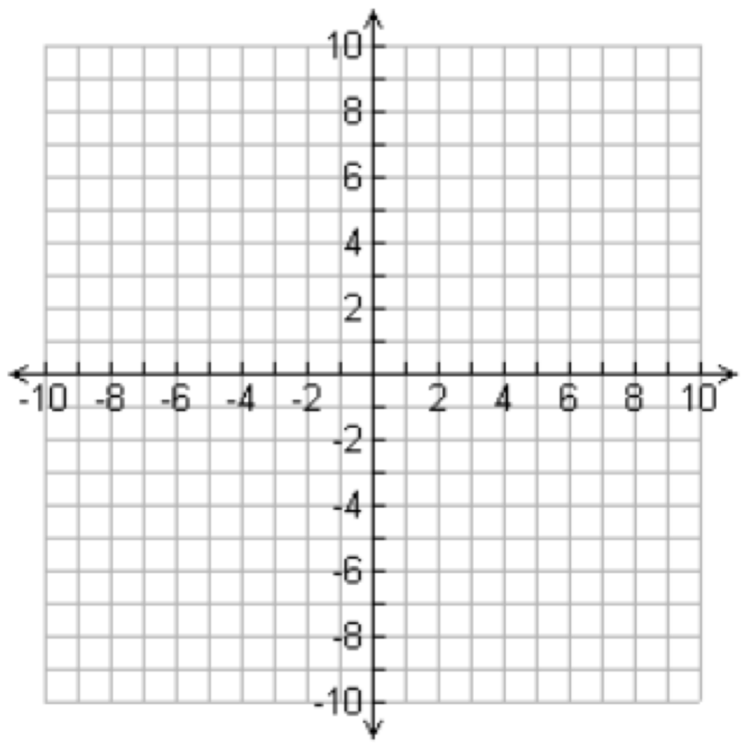
When you have a **trigonometric equation**, you will need to use another process to eliminate the parameter…One method is to **square both sides** and **add** or **subtract** the sides of each equation together. (You are attempting to form any of the Pythagorean Identities).

Ex.4: $x = 2 \sin \theta$

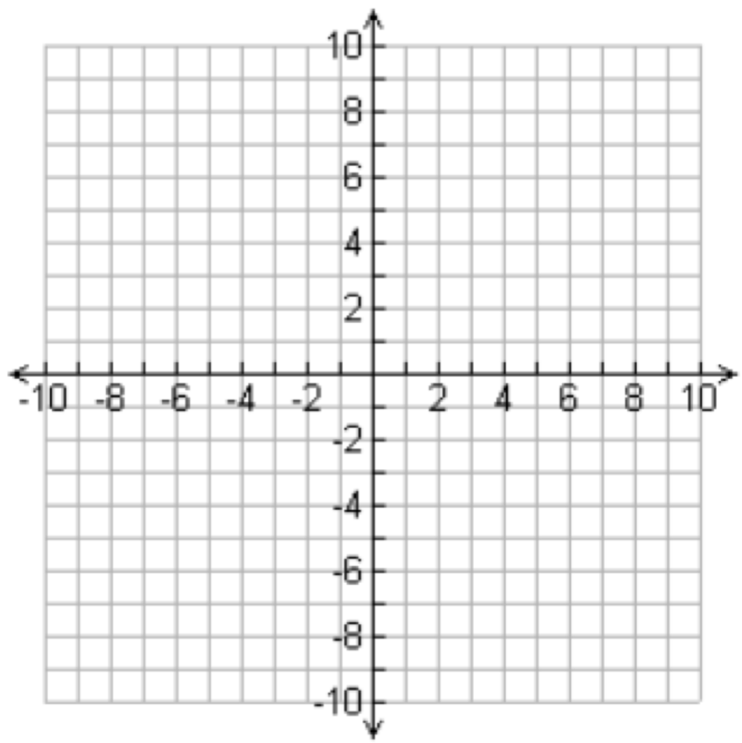
$y = 2 \cos \theta$



Ex.5: $x = 5 \cos \theta$ $y = 2 \sin \theta$



Ex.6: $x = 4\sec t$ $\qquad$ $y = 3\tan t$



Ex.7: x = 4^{-t} y = 4^{2t}