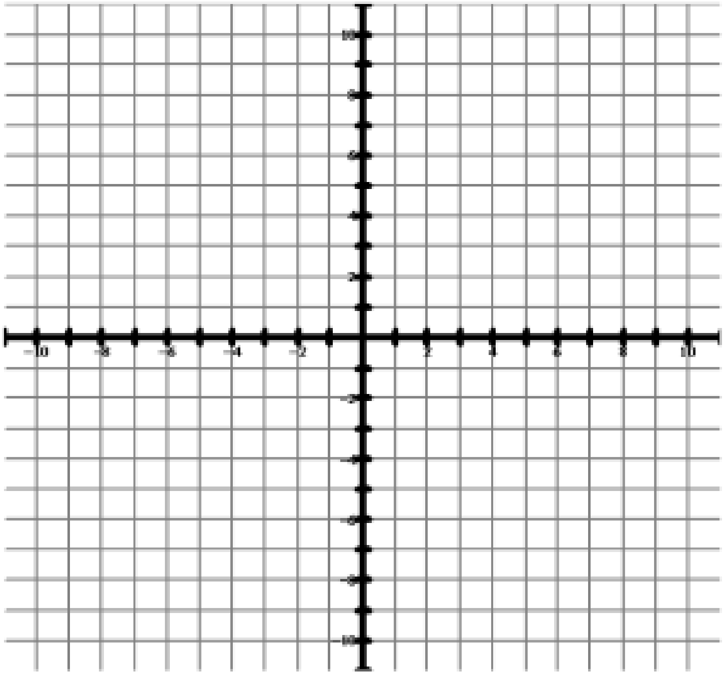
Sec 10.1:
Parametric Functions

A parametric function is one where both x and y depend on a third variable, t (for time.)

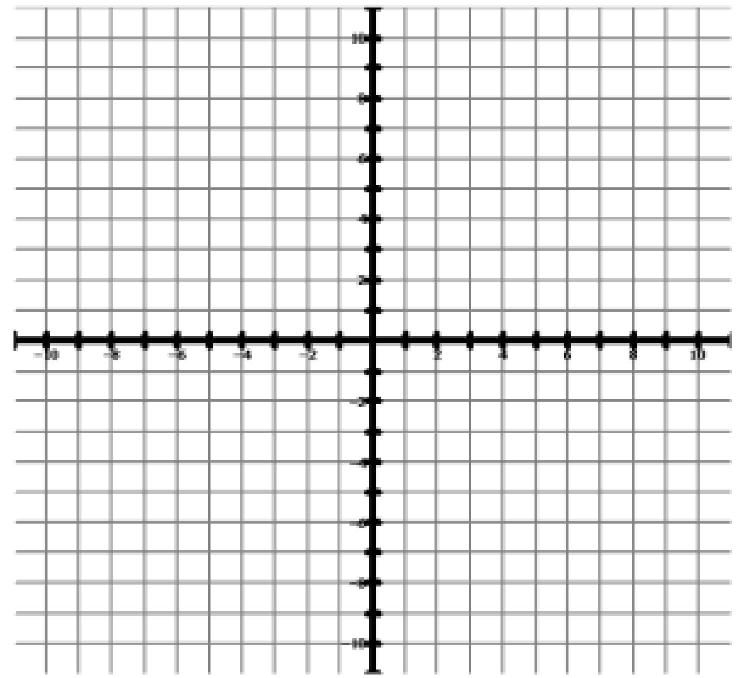
Make a table of values and sketch the curve, indicating direction of movement. Then eliminate the parameter and write y as a function of x. Make sure to limit your domain when needed.

$$x(t) = \sqrt{t} \quad y(t) = t + 1$$



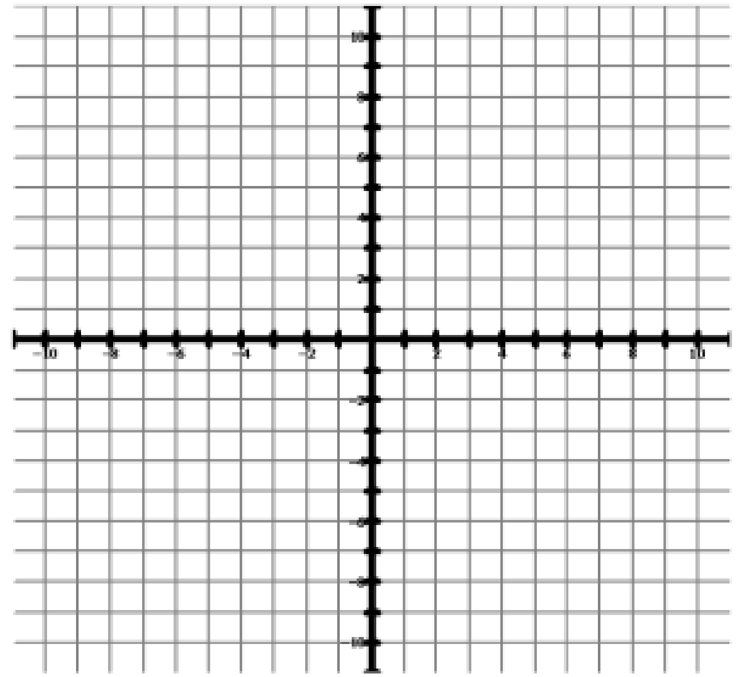
Make a table of values and sketch the curve, indicating direction of movement. Then eliminate the parameter and write y as a function of x. Make sure to limit your domain when needed.

$x(t) = t^2 - 2 \qquad y(t) = \frac{t}{2} \qquad -2 \le t \le 3$



Make a table of values and sketch the curve, indicating direction of movement. Then eliminate the parameter and write y as a function of x. Make sure to limit your domain when needed.

$x(t) = 3 + 2\cos t \qquad y(t) = -1 + 3\sin t$



Formulas for Parametric Functions:

If a smooth curve, C, is given by the equations $x = f(t) \quad y = g(t)$

- slope of the curve at the point (x, y) is $\dfrac{dy}{dx} = \dfrac{\frac{dy}{dt}}{\frac{dx}{dt}}$

- the second derivative is $\dfrac{d^2y}{dx^2} = \dfrac{\frac{d}{dt}\left[\frac{dy}{dx}\right]}{\frac{dx}{dt}}$

- the length of an arc from a to b is $\displaystyle\int_a^b \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2}\,dt$

Given the parametric equations below, find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$

$$x = 2\sqrt{t} \qquad y = 3t^2 - 2t$$

Write the equation of the tangent line to the curve at the point where $t = \frac{3\pi}{4}$ given

$$x = 4\cos t \qquad y = 3\sin t$$

Set up an integral expression for the arc length of the curve given by the parametric equations $x = t^2 + 1, y = 4t^3 - 1, 0 \le t \le 1$. Do not evaluate.