

<http://calculator.runiter.com/graphing-calculator/online-graphing-calculator.htm>

$y = x^2 - 3x + 2$ is y , explicitly given as a function of x .

$x^2 + y^2 = 1$ is an equation that implicitly gives y as (a) function(s) of x

$y = \sqrt{1-x^2}$
 $y = -\sqrt{1-x^2}$ is a way to graph it as two explicit functions.

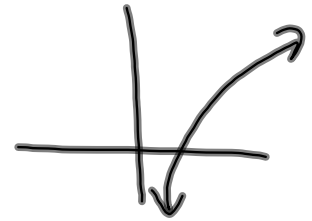
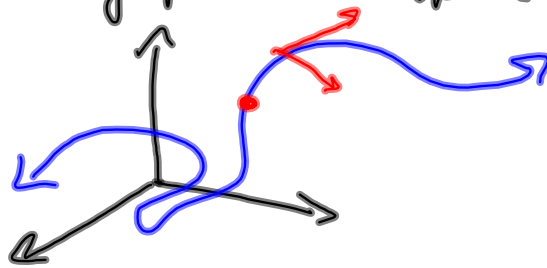
S14.1 Space Curves
Vector-valued Functions.

$$\langle x(t), y(t), z(t) \rangle$$

What's the domain of

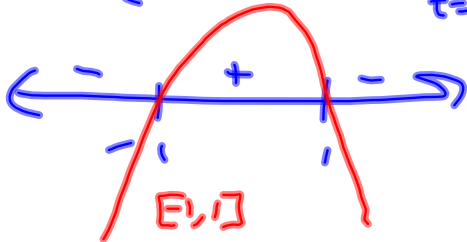
$$\vec{v}(t) = \langle \sqrt{1-t^2}, e^{2t}, \ln(t+1) \rangle ?$$

Its graph is a space curve



Need $1-t^2 \geq 0$

$$(1-t)(1+t) \geq 0$$



AND
 $t \geq 0$
 $(1)(1) = 1 > 0$

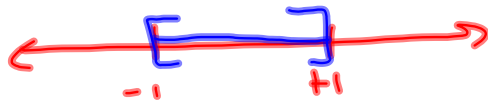
$$t+1 > 0$$

$$t > -1$$

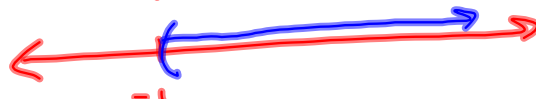
$$(-1, \infty)$$

AND

$$[-1, 1] \cap (-1, \infty) = (-1, 1]$$



Take the overlap,



$$(-1, 1]$$

limits of vector-valued functions.

$$\lim_{t \rightarrow c} \langle x(t), y(t), z(t) \rangle = \langle \lim_{t \rightarrow c} x(t), \lim_{t \rightarrow c} y(t), \lim_{t \rightarrow c} z(t) \rangle$$

$$\lim_{t \rightarrow 0^+} \langle \cos(t), \sin(t), t \ln(t) \rangle$$

$$= \langle 1, 0, 0 \rangle$$

$$\lim_{t \rightarrow 0^+} t \ln(t) = \lim_{t \rightarrow 0^+} \frac{\ln(t)}{\frac{1}{t}} \stackrel{\text{L'H}}{=} \lim_{t \rightarrow 0^+} \frac{\frac{1}{t}}{-\frac{1}{t^2}} =$$

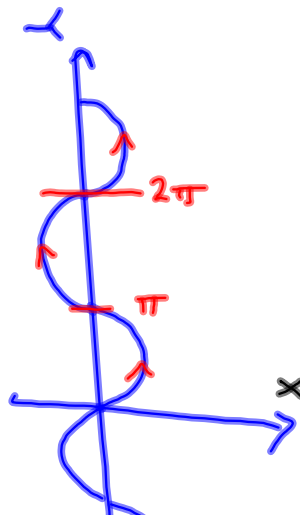
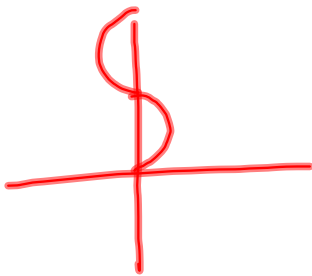
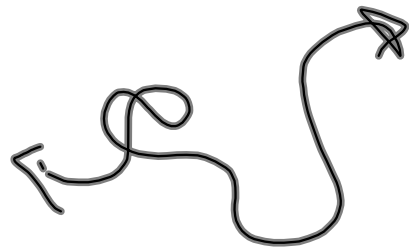
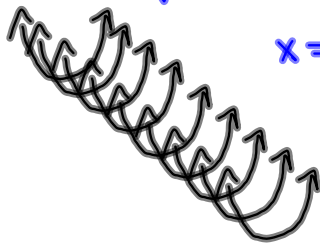
$$= \lim_{t \rightarrow 0^+} \left(\frac{1}{t} \cdot \frac{-t^2}{1} \right) = \lim_{t \rightarrow 0^+} (-t) = -0$$

Graph:

$$x = \sin t, y = t$$

Eliminate the parameter:

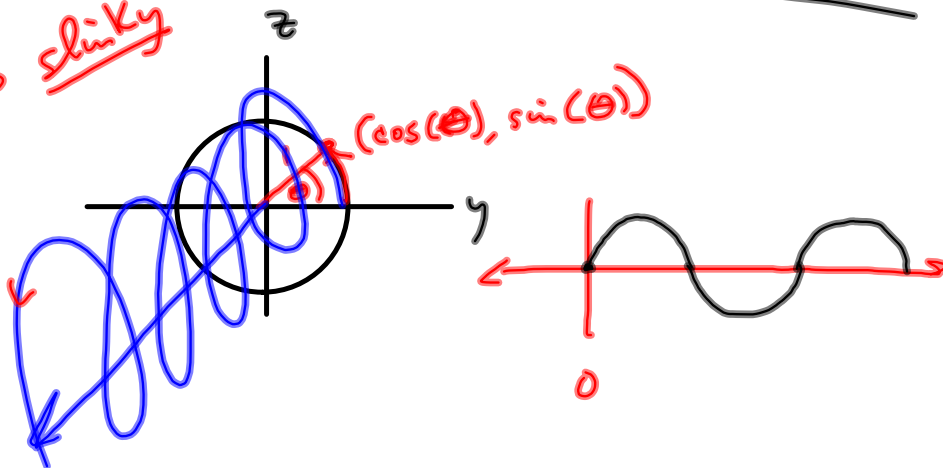
$$x = \sin y$$



$$\underline{x = t, y = \cos(2t), z = \sin(2t)}$$

$$x = t, y = \cos(2x), z = \sin(2x) \left\{ \begin{array}{l} y^2 + z^2 = \cos^2(2x) + \sin^2(2x) = 1 \end{array} \right.$$

It's slinky



$x=t^2$, $y=t$, $z=2$
Its graph's $x=y^2$ in the plane $z=2$

