Animation for an Ellipse

For our example we'll use the ellipse

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

First we need to parameterize the ellipse

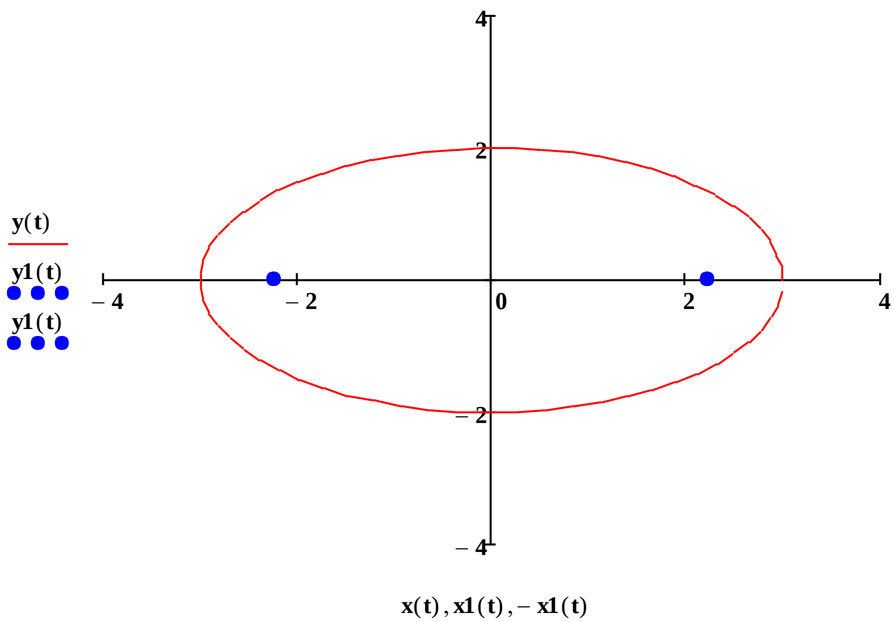
$t := 0, .1 .. 2 \cdot \pi$ Later we'll change the 2π to FRAME (π /48) but for now to see how everything will look we'll use 2π

$x(t) := 3 \cdot \cos(t)$ $y(t) := 2 \cdot \sin(t)$

Next we'll plot the foci:

$x1(t) := \sqrt{5}$ $y1(t) := 0$ change plots 2 and 3 to points and add a symbol

We plot y1(t) twice on the vertical and x1(t) and -x1(t) on the horizontal



We need the parametric equations of the line segments from the foci to a point (x,y)

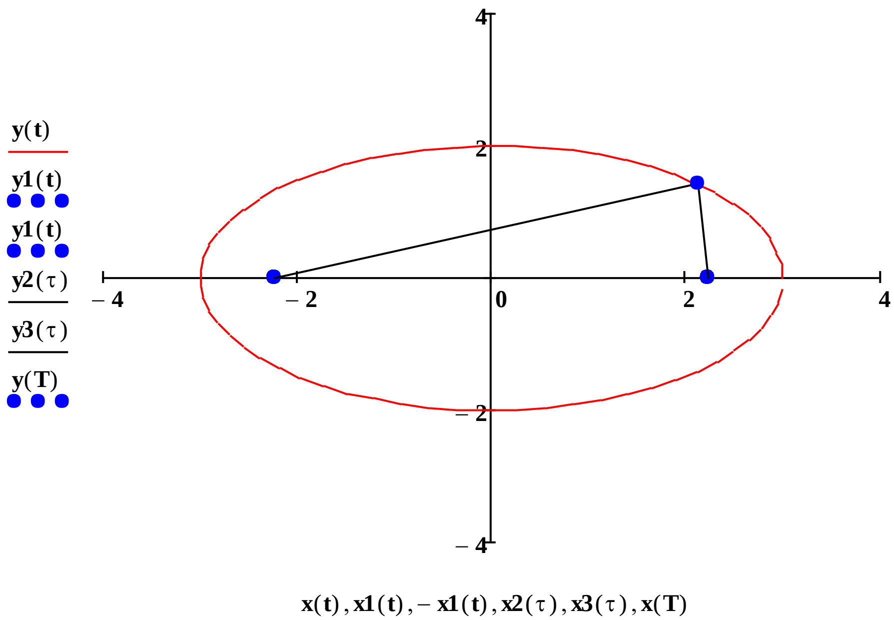
on the graph. We'll also put in the point on the graph -- we can simply use x(T) and y(T)

$T := \frac{\pi}{4}$ Again later we'll change this to FRAME(π /48) . $\tau := 0..1$

$x2(\tau) := \sqrt{5} + \left(x(T) - \sqrt{5}\right)\cdot\tau$ $y2(\tau) := (y(T))\cdot\tau$

$x3(\tau) := -\sqrt{5} + \left(x(T) + \sqrt{5}\right)\cdot\tau$ $y3(\tau) := (y(T))\cdot\tau$

Change plots 4 and 5 solid and make the color black
Change plot 6 to points and add a symbol.

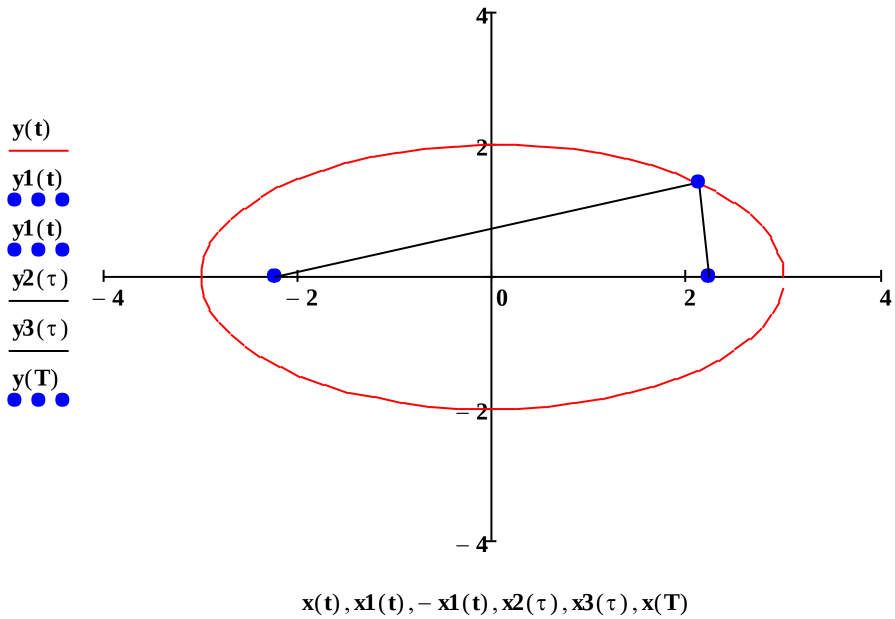



The last things we'll add are the functions which calculate the distances from the foci
to the point (x(T),y(T))

$d1(T) := \sqrt{\left(x(T) - \sqrt{5}\right)^2 + y(T)^2}$ $d2(T) := \sqrt{\left(x(T) + \sqrt{5}\right)^2 + y(T)^2}$

For the evaluation of T uses T (ctrl-period) enter to get T in multiples of π .For a single frame it will appear as follows:

$T \rightarrow \frac{\pi}{4}$ $d1(T) = 1.419$ $d2(T) = 4.581$ $d1(T) + d2(T) = 6$




Now let's put it all together

$t := 0, .1 .. FRAME\left(\frac{\pi}{48}\right)$

$x(t) := 3 \cdot \cos(t)$ $y(t) := 2 \cdot \sin(t)$

$x1(t) := \sqrt{5}$ $y1(t) := 0$

$T := \text{FRAME}\left(\frac{\pi}{48}\right) \qquad \tau := 0..1$

$x2(\tau) := \sqrt{5} + \left(x(T) - \sqrt{5}\right)\cdot\tau \qquad y2(\tau) := (y(T))\cdot\tau$

$x3(\tau) := -\sqrt{5} + \left(x(T) + \sqrt{5}\right)\cdot\tau \qquad y3(\tau) := (y(T))\cdot\tau$

$d1(T) := \sqrt{\left(x(T) - \sqrt{5}\right)^2 + y(T)^2} \qquad d2(T) := \sqrt{\left(x(T) + \sqrt{5}\right)^2 + y(T)^2}$

$T \rightarrow 0 \qquad d1(T) = 0.764 \qquad d2(T) = 5.236 \qquad d1(T) + d2(T) = 6$