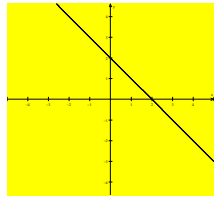


Suppose you're given the parametric equations  $x = 2 + t^2$   
 $y = -t^2$



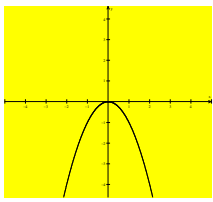
which corresponds to the rectangular equation  $y = 2 - x$  (shown on the right →),

and you need to determine which part of the graph is being traced out and in what orientation.

1. Decide which parametric equation ( $x =$  or  $y =$ ) you find easier to analyze.

$y = -t^2$  will be easier

2. Sketch a graph of the function you chose in step 1, with the horizontal axis representing  $t$ , and the vertical axis representing whichever variable you chose in step 1 (in this case,  $y$ ).



3. Describe what's happening on the graph in step 2 as  $t$  goes from  $-\infty$  to  $\infty$  (ie. as you move from left to right). Every time the graph changes general direction (from going up to going down, from going down to going up, or making a sudden discontinuous jump), describe that change (from what value to what value).

As  $t$  goes from  $-\infty$  to  $\infty$ ,  
 $y = -t^2$  goes from  $-\infty$  to 0 to  $-\infty$

4. Go to the graph of the original rectangular equation and identify which "points" on its graph correspond to the  $x$  - or  $y$  - values you found in step 3.

Remember that

- $x = -\infty$  corresponds to the far left side of the graph
- $x = \infty$  corresponds to the far right side of the graph
- $y = -\infty$  corresponds to the bottom of the graph
- $y = \infty$  corresponds to the top of the graph
- $x = 0$  corresponds to the  $y$  - intercept of the graph
- $y = 0$  corresponds to the  $x$  - intercept of the graph

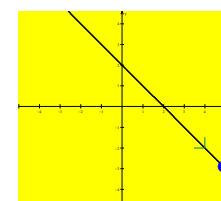
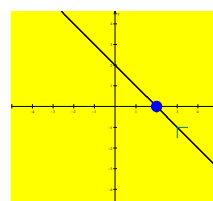
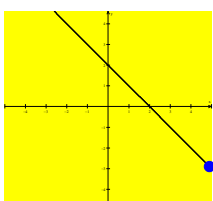
**you can use the rectangular equation to find specific points**

$y = -t^2$  goes from  $-\infty$  to 0 to  $-\infty$ , so the parametric curve goes from

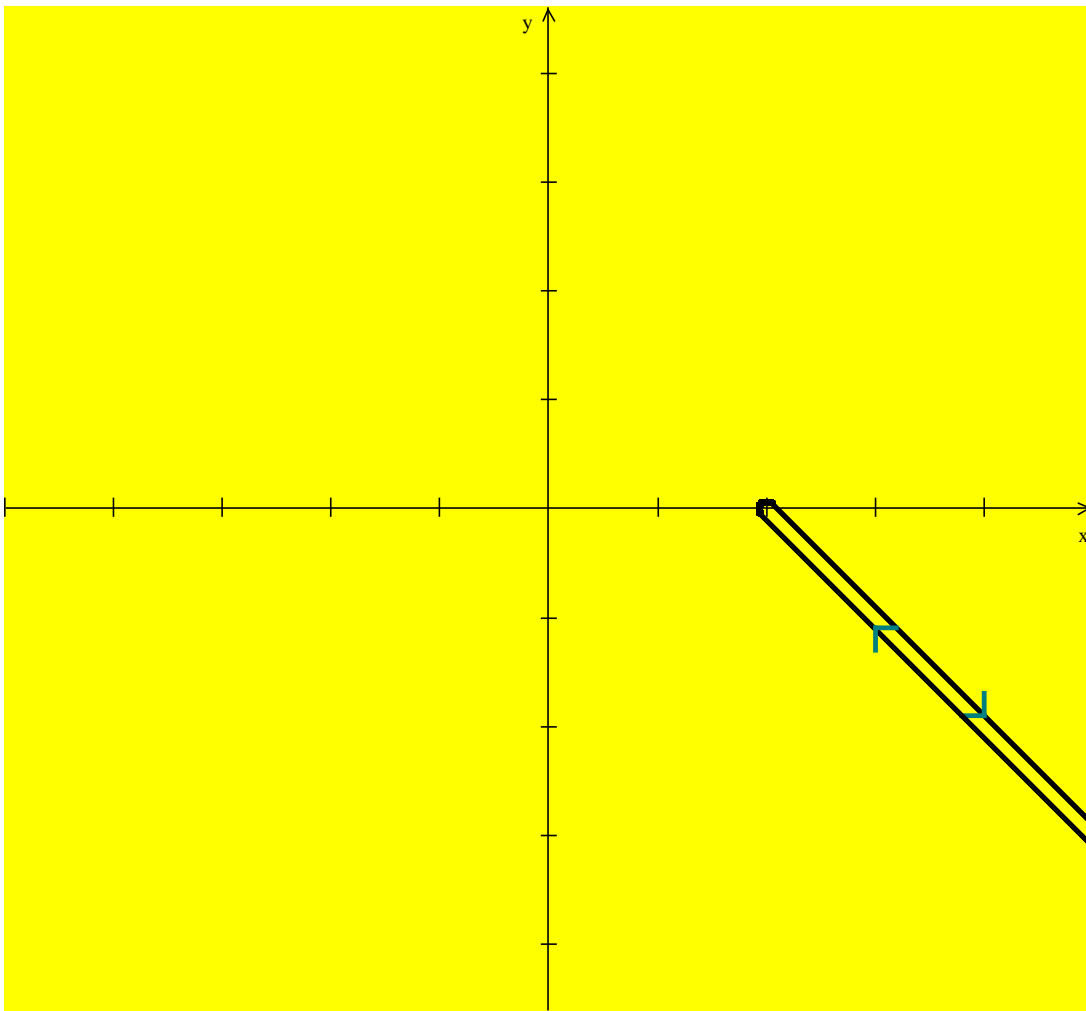
the bottom of the graph of  $y = 2 - x$

to the  $x$  - intercept (2, 0)

to the bottom



5. Sketch out only what you described in step 4.



**YOUR TURN:** (check using your calculator AFTER you have a solution)

A. Analyze the parametric equations  $x = -t^4$ ,  $y = -t^8$ , which correspond to the rectangular equation  $y = -x^2$ , by analyzing the  $x =$  equation.

B. Analyze the parametric equations  $x = e^{-t}$ ,  $y = 2 - e^{-t}$ , which correspond to the rectangular equation  $y = 2 - x$ , by analyzing the  $x =$  equation.

C. Analyze the parametric equations  $x = e^{2t}$ ,  $y = -e^t$ , which correspond to the rectangular equation  $x = y^2$ . You must decide which parametric equation to analyze (try both, but one will be easier than the other).

D. Analyze the parametric equations  $x = \sin t$ ,  $y = \cos^2 t$ , which correspond to the rectangular equation  $y = 1 - x^2$ . You must decide which parametric equation to analyze.

E. Analyze the parametric equations  $x = 4 - 2 \ln t$ ,  $y = \ln t$ . You must find the rectangular equation, and decide which parametric equation to analyze.