Suppose you're given the parametric equations $x = 2 + \frac{1}{2}$

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

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 ∞ (i.e. as you move from left to right). Every time the graph changes 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 ∞ , $y = -t^2$ 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





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 $\begin{cases} x = -t^4 \\ y = -t^8 \end{cases}$, which correspond to the rectangular equation $y = -x^2$, by analyzing the x = equation.
- B. Analyze the parametric equations $\begin{cases} x = e^{-t} \\ y = 2 e^{-t} \end{cases}$, which correspond to the rectangular equation y = 2 x, by analyzing the x = equation.
- C. Analyze the parametric equations $\begin{cases} x = e^{2t} \\ y = -e^t \end{cases}$, 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 $\begin{cases} x = \sin t \\ y = \cos^2 t \end{cases}$, which correspond to the rectangular equation $y = 1 x^2$. You must decide which parametric equation to analyze.
- E. Analyze the parametric equations $\begin{aligned} x &= 4 2\ln t \\ y &= \ln t \end{aligned}$

You must find the rectangular equation, and decide which parametric equation to analyze.