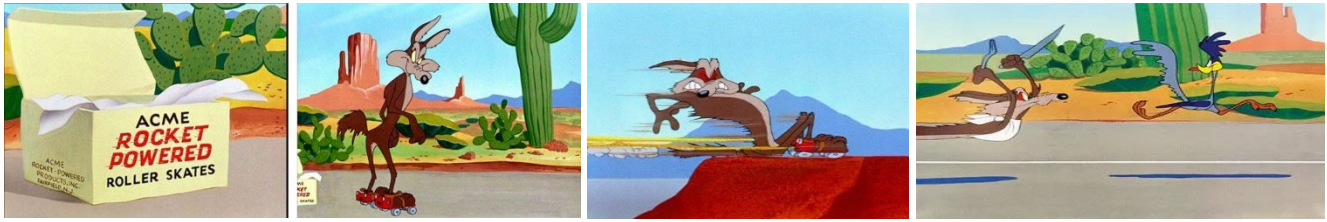


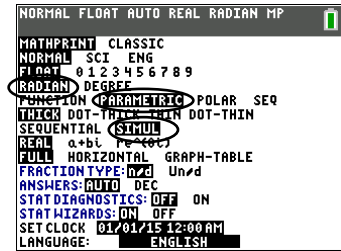
Wile E. Coyote's Roller Skate Chase



Click on the image to view an clip of this episode.

With the help of some Acme rocket powered roller skates, Wile E. Cote will attempt to snatch the Road Runner. We will use the TI-84 Plus CE and parametric mode to simulate this real-world scenario.

1. Press **[mode]** and select **Parametric** and **Simultaneous Graphing**. Please make sure you are also in **Radians**.



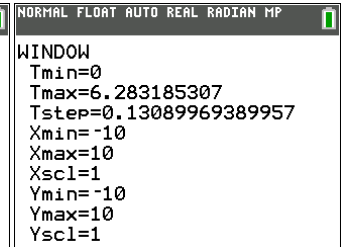
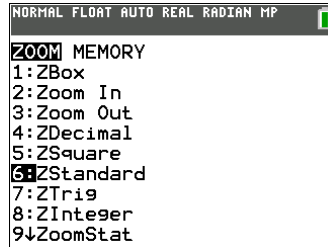
2. Press **[zoom]** 4: ZStandard for the standard window.

Press **[window]**.

Notice the standard settings are

$$0 \leq t \leq 2\pi \text{ in steps of } Tstep = \frac{\pi}{24}$$

with $-10 \leq x \leq 10$ by $-10 \leq y \leq 10$.

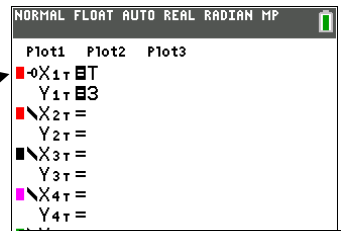


3. Press **[y=]**.

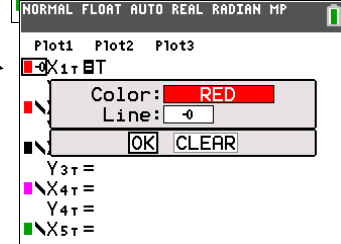
Enter $x(t) = t$, $y(t) = 3$ which will animate the Road Runner's path.

Press **[left]** until you can't any more, then press **[enter]**.

Optional: Press **[right]** (84CE) or **[enter]** (84) to change the graph style to animated path (4).



Optional (TI-84CE only): Use the spinner to change the graph color to red.



Press **[graph]**. Press **[trace]** and **[right]** to observe the graph.

4. Press **[window]** to change the window settings so the Road Runner traverses the *entire screen* for $-10 \leq x \leq 10$.

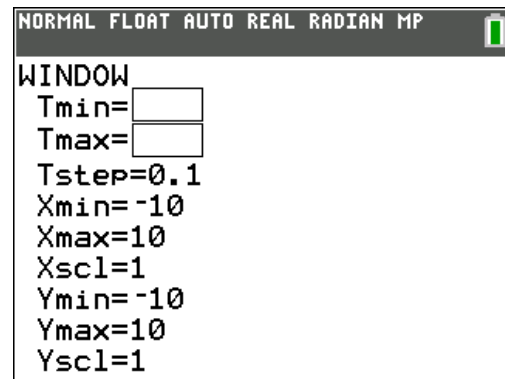
Complete the boxes on the screen to the right with your values.

TI-84CE: Change Tstep to 0.1 for convenience. Season to taste.

TI-84: Change Tstep to 0.5 for convenience. Season to taste.

This affects the speed of the graph.

Press **[graph]** to see Road Runner cross the screen at a constant speed.



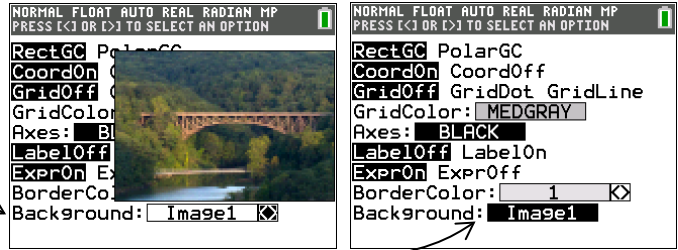
TIP: To replay the graph, press **[2nd][draw]** 1:ClrDraw. Press **[graph]**.

5. Optional (TI-84CE only):

Press $\text{2nd}[\text{format}]$ to access the Graph Format menu.
Place your cursor on the Background Spinner.
Press right arrow on the spinner to select Image1.

Then press up arrow or down arrow .

Image1 should be highlighted.

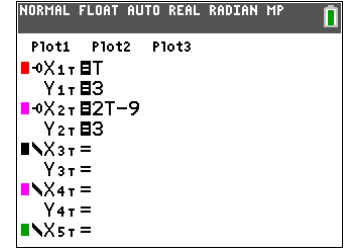


Press graph to see Road Runner cross the bridge.

6. Press y= .

Enter $x(t) = 2t - 9, y(t) = 3$ to animate Wile E. Coyote's path.

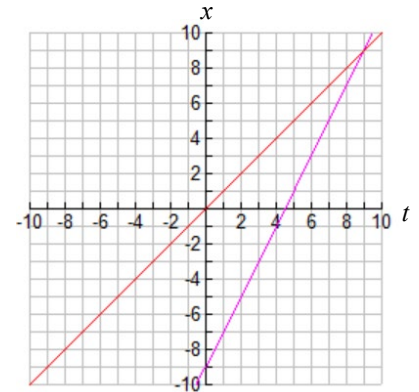
Press graph . What do you notice? What do you wonder?



7. To the right are the graphs of $x(t) = t$ and $x(t) = 2t - 9$.

Notice x is on the **vertical** axis.

What connections are there between the graphs to the right and the animation of Road Runner and Coyote?



8. Work with a partner with the same calculator model and graph style settings as yours.

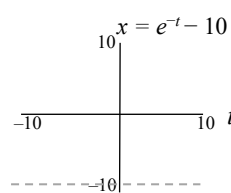
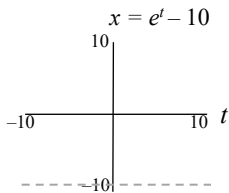
Clear or deselect Wile E. Coyote's previous formulas graph in $x_2 y_2$. Describe how does he move for each. Sketch a graph of $x(t)$ for each below. What symmetry do you notice in the graphs and the speeds?

Partner A enters: $x(t) = e^t - 10$
 $y(t) = 3$

Partner B enters: $x(t) = e^{-t} - 10$
 $y(t) = 3$

Description of how he moves (left, right, speeds up slows down):

Description of how he moves (left, right, speeds up slows down):



9. On your grapher pick two of the parametric equations below. Assign one to Road Runner and another for Wile and enter them both into your grapher, using the same window as before (and the same graph styles for each). Observe *how* each moves across the bridge. Notice when each speeds up and slows down and which one overtakes the other. Which formulas go back and forth? Make connections with the graph of $x(t)$ vs t .

Optional: Construct your own set with $-10 \leq x(t) \leq 10$ for $-10 \leq t \leq 10$.

$x(t) = 10 - 2 t $	$x(t) = 10 - 0.2t^2$	$x(t) = 0.01t^3$
$y(t) = 3$	$y(t) = 3$	$y(t) = 3$
$x(t) = 10\cos(0.1\pi t)$	$x(t) = 10\sin(0.1\pi t)$	$x(t) = \tan\left(\frac{\pi t}{20}\right)$
$y(t) = 3$	$y(t) = 3$	$y(t) = 3$



Imagine the graph of the function $x(t)$ vs t is crushed by an Acme Anvil and is flattened onto the horizontal line $y = 3$.

Wile E. Coyote's Flying Wing Suit

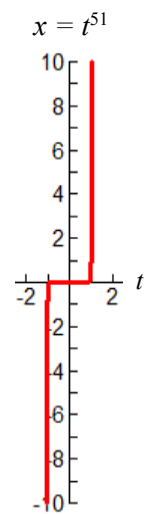
With the help of a handy Acme flying wing suit and some bird seed, Wile E. Cote will attempt to drop down from the sky to snatch the distracted Road Runner.



Click on the image to see the animation.



1. We will use the parametric equations $x(t) = t^{51}$, $y(t) = 3$ for the Road Runner's path. Before entering these into your grapher, discuss the following with your group.
 - a. Describe the behavior of the graph of $x(t) = t^{51}$, shown to the right, for $-1 < t < 1$. What do you notice about his speed?
 - b. Describe the behavior of the graph of $x(t)$, shown to the right, for $t < -1$ and $t > 1$. What do you notice about his speed?
 - c. Report the x and y value of his path $t = 0$. $x =$ _____ $y =$ _____ What is Road Runner doing?



2. We will use the parametric equations $x(t) = e^{-t}$, $y(t) = e^{-t} + 3$ for Wile E. Coyote's path. Before entering these into your grapher, discuss the following with your group.

- a. i. Eliminate the parameter to report the path in terms of y and x .

$y(x) =$ _____ (This is called an *explicit* form.)

ii. What kind of function is this?

iii. Complete: As x increases, the graph of $y(x)$ _____.
{increases, decreases}

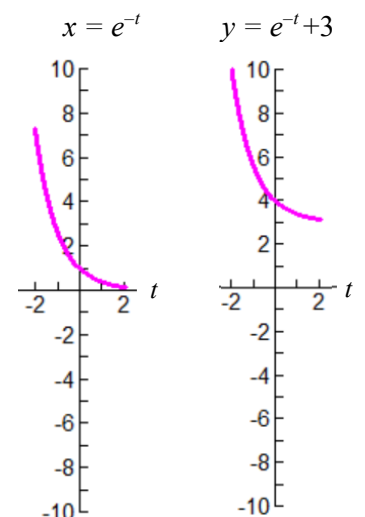
As t increases, the graph of $y(x)$ _____.
{increases, decreases}

- b. Report the domain and range of Wile E. Coyote's motion path (y vs x) you found in Question 2ai, restricted to $-2 \leq t \leq 2$.

	Domain	Range
Exact		
Approximate (to 1 decimal place)		

- c. On $-2 \leq t \leq 2$, does Wile E. Coyote ever reach the point in 1c? YES NO

3. Press $\boxed{Y=}$, enter the formulas into your grapher. Press $\boxed{\text{window}}$ to change the window settings to simulate this from $-2 \leq t \leq 2$. Press $\boxed{\text{graph}}$.



```

NORMAL FLOAT AUTO REAL RADIAN MP
WINDOW
Tmin=-2
Tmax=2
Tstep=0.01
Xmin=-10
Xmax=10
Xscl=1
Ymin=-10
Ymax=10
Yscl=1
    
```