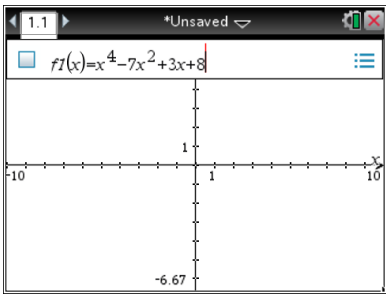
Exploring Different Graph Types

TI PROFESSIONAL DEVELOPMENT

Activity Overview

Most users of technology have had experience graphing functions. This activity explores the features of the Analyze tool and additional graph types available with TI-Nspire™ technology: Parametric, Sequence, Polar, Differential Equations and other types of graphs.

Analyzing the Graph of a Function



Open a new document with a Graphs page.

- Enter the function: $f1(x) = x^4 - 7x^2 + 3x + 8$. Press enter.
- Adjust the window so that you can see "points of interest."
- Use the **Analyze Graph** Menu to find:

  (1) a zero of the function;

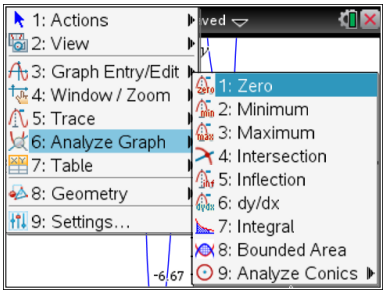
  (2) a local maximum of the function;

  (3) a local minimum of the function;

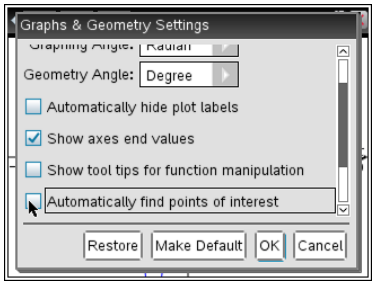
  (4) the slope of a tangent line at a point on the graph;

  (5) the area between a portion of the curve and the *x*-axis;

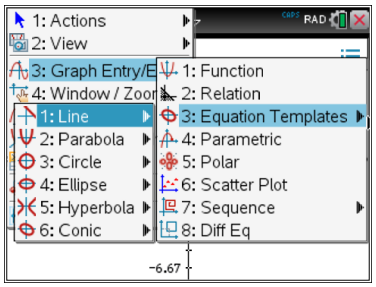
  (6) the coordinates of a point of inflection (TI-Nspire™ CAS handheld only).



- Which of the items above could you determine without using the **Analyze Graph** menu? How?
- Note: The trace function can be set to automatically find points of interest. To turn this feature on and off go to **Menu > Settings**. Scroll or tab down to find the appropriate tab. Click in the box in front to turn on/off.
- Note: If the entry line is not displayed or to graph another function, press tab or select **Menu > Graph Entry/Edit > Function.**



Equations



Add a new problem with a Graphs page.

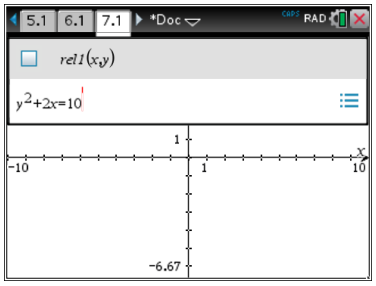
Select **Menu > Graph Entry/Edit**. Choose **Equation Templates.**

1. Graph the conic: $x^2 - 2xy + 3y^2 + 4x - 3y - 5 = 0$.

- What happens if you change the coefficient of the y^2 term to -3?

- Discuss how you might use the equation grapher in an algebra class.

Relations



Add a new problem with a Graphs page.

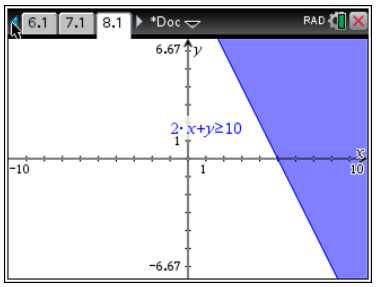
Select **Menu > Graph Entry/Edit**. Choose **Relation.**

1. Graph the relation $y^2 + 2x = 10$.

- How is this different than the graph of the function $y = \sqrt{10 - 2x}$.

- What tools on the **Analyze Graph** menu can be used to explore the curve, if any?

Inequalities



Add a new problem with a Graphs page.

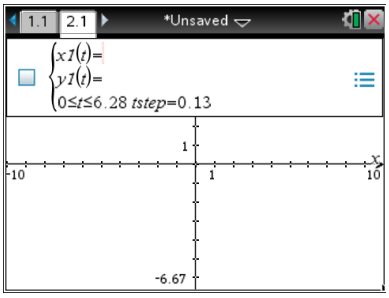
Select **Menu > Graph Entry/Edit.** Choose **Relation**.

Graph 2x + y ≥ 10

You can graph systems of inequalities using this method also.

- What tools on the **Analyze Graph** menu can be used with a system of inequalities?

Parametric



Add a new problem with a Graphs page.

Select **Menu > Graph Entry/Edit**. The different graph types will be displayed. Choose **Parametric**.

1. Graph the equation $\begin{cases} x(t) = t + 2 \\ y(t) = t^2 - 1 \end{cases}$.

   - What is the function variable?
   - What are the window variables?
   - Trace the graph and explain how it is "created."
   - How do you adjust the settings to graph more of the curve?
   - What tools on the **Analyze Graph** menu can be used to explore the curve, if any?
   - Rewrite as a function and graph in function type.

2. Add a new Graphs page and graph the following:

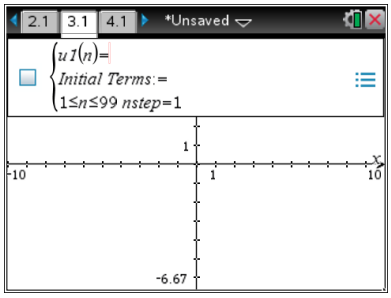
$$\begin{Bmatrix} x(t) = 5\sin(t) \\ y(t) = 5\cos(t) \end{Bmatrix}$$

   - Is the graph complete?
   - Change the Settings to graph the following:

$$\begin{Bmatrix} x(t) = 5\sin(t) \\ y(t) = 5\cos(t) \\ 0 \le t \le 720^\circ \; tstep = 120^\circ \end{Bmatrix}$$

   - Is it the same? Should it be? Explain.

Sequence



Add a new problem with a Graphs page.

Select **Menu > Graph Entry/Edit**. The different graph types will be displayed. Choose **Sequence > Sequence**.

1. Graph $\begin{Bmatrix} u_1 = 2 \\ u_n = u_{n-1} + 3 \end{Bmatrix}$.

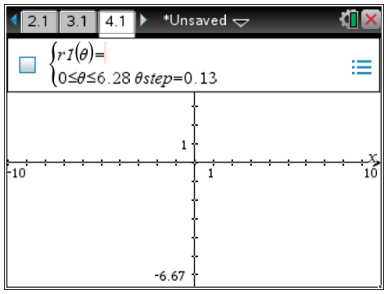
   - Note: In this example, the *Initital Term* is 2 and u1(n) = u1(n-1) + 3.
   - What is the function variable?
   - Explain how the graph is "created."
   - What are the Window variables?
   - How do you adjust the settings to graph more of the curve?
   - What tools on the **Analyze Graph** menu can be used to explore the curve, if any?

2. Add a new Graphs page and graph the following:

$$\begin{Bmatrix} u_1 = 1 \\ u_2 = 1 \\ u_n = u_{n-1} + u_{n-2} \end{Bmatrix}.$$

   - Note: If the sequence expression references more than one prior term, separate the terms with commas.
   - What is the name of this well-known sequence?

Polar



Add a new Problem with a Graphs page.

Select **Menu > Graph Entry/Edit**. The different graph types will be displayed. Choose **Polar**.

1. Graph the equation $r = 4\cos(2\theta)$.

   - What is the function variable?
   - What are the Window variables?
   - Trace the graph and explain how it is "created."
   - What tools on the **Analyze Graph** menu can be used to explore the curve, if any?
   - How does changing the two constants change the graph?

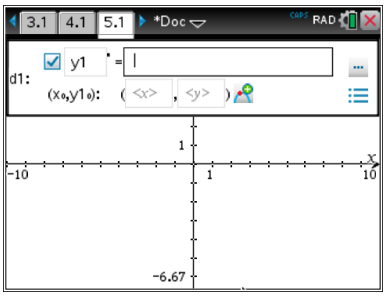
2. Add a new Graphs page and graph the following: $r = 5$.

   - Change the Settings to graph the following:

     $$\left\{\begin{matrix} r = 5 \\ 0 \le t \le 720^\circ \; tstep = 120^\circ \end{matrix}\right\}$$

     How is it different?

Differential Equations



Add a new problem with a Graphs page.

Select **Menu > Graph Entry/Edit**. The different graph types will be displayed. Choose **Diff Eq** (**Differential Equations)**.

1. Graph the equation $y' = 0.5y$ with initial condition $(1,1)$.

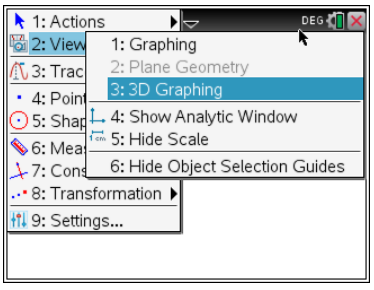
   - Note: Since the first differential equation is in terms of *y*1, enter 0.5*y*1 to the right of the equals sign.
   - How can the initial condition be changed on the graph screen?
   - How does changing the coefficient in the differential equation change the graph?
   - What does the graph of the solution appear to be?
   - Can you find the explicit form of the equation?

2. The differential equation, $y' = 0.003498(375 - y)$ models the following problem:

   A 4 pound roast, initially at $50^\circ F$, is placed in a $375^\circ F$ oven.

   How long will it take the roast to be medium rare ($150^\circ F$)?

3-D Graphing



Add a new problem with a Geometry or Graphs page.

Select **View > 3D Graphing**.

Graph z (x,y) = $y^2 - 4$

1. Explore the graph. Use your cursor to rotate the graph around its axes.
2. Use the **menu** to explore the functionality of the 3D Graphing feature.