

## Parametric Equations

### Overview:

Parametric equations are equations that express the coordinates  $x$  and  $y$  as separate functions of a common third variable, called the parameter. You can use parametric equations to determine the position of an object over time.

### Problem Situation:

Starting from a birdbath 3 ft above the ground, a bird takes flight. Let  $t$  equal time in seconds,  $x$  equal horizontal distance in feet, and  $y$  equal vertical distance in feet. The equations  $x(t) = 5t$  and  $y(t) = 8t + 3$  model the bird's distance from the base of the birdbath. Graph the equations. Describe the position of the bird at time  $t = 3$ .

### Teacher Notes:

I find it handy to save some time in setting up the students calculators by sending them a Graph Database File (GDB). This file(s) will record all information from window setting to format, to equations in  $y=$ . It captures the entire GDB. I set up my calculator with the following setting:

```
SCI  ENG
FLOAT  0 1 2 3 4 5 6 7 8 9
RADIAN DEGREE
FUNC  PAR  POL  SEQ
CONNECTED  DOT
SEQUENTIAL  SIMUL
REAL  a+bi  re^θi
FULL  HORIZ  G-T
SET CLOCK 10/31/07 8:51AM
```

```
NORMAL SCI  ENG
FLOAT  0 1 2 3 4 5 6 7 8 9
RADIAN DEGREE
FUNC  PAR  POL  SEQ
CONNECTED  DOT
SEQUENTIAL  SIMUL
REAL  a+bi  re^θi
FULL  HORIZ  G-T
SET CLOCK 10/31/07 8:51AM
```

Change Mode from Func to Par.

```
WINDOW
Tmin=0
Tmax=6
Tstep=.1
Xmin=0
Xmax=50
Xscl=2
↓Ymin=0
```

```
WINDOW
↑Tstep=.1
Xmin=0
Xmax=50
Xscl=2
Ymin=0
Ymax=50
Yscl=2
```

Change the window to reflect the prior.

Go to Draw.

DRAW POINTS STO 1:ClrDraw 2:Line( 3:Horizontal 4:Vertical 5:Tangent( 6:DrawF 7↓Shade( 	DRAW POINTS <b>STO</b> 1:StorePic 2:RecallPic 3:StoreGDB 4:RecallGDB 
StoreGDB ■ 	StoreGDB 1 Done 

Save the GDB as “1”.

Open TI Connect and pull the GDB 1 file to your desktop.

Open TI Navigator.

Have the student’s login.

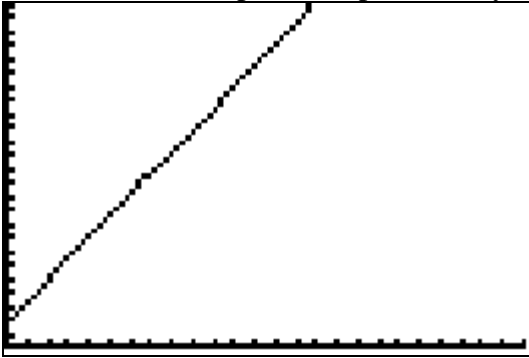
Send the GDB 1 file to the students.

Procedure:

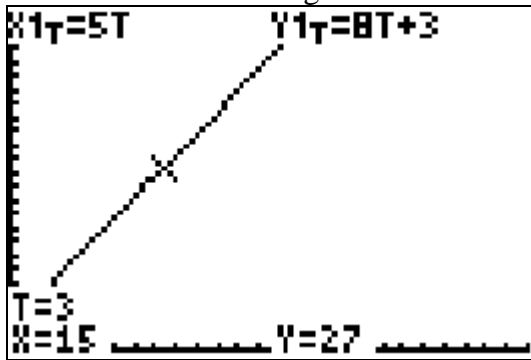
Now that the students have the same GDB file, have them enter the equations into y=.

Plot1	Plot2	Plot3
X1T	5T	
Y1T	8T+3	
X2T	=	
Y2T	=	
X3T	=	
Y3T	=	
X4T	=	

Have the students press Graph and they should all see the following:



Now have the students answer the question at hand. Describe the position of the bird at  $t = 3$ . Have the student's press 2<sup>nd</sup> and Trace and find the value at  $x = 3$ . The student's should see the following:



Teacher Notes:

The answer is: three seconds after taking flight, the bird is 15 ft horizontally and 27 feet vertically from the base of the birdbath.

To close the activity, send another GDB that has the original factory settings so the students can resume function graphing.