

Name _____ Date _____

Cool Stuff

Mission 8

There is more to your robot and TI-83 Plus than meets the eye. Alfred and George live inside along with an exploding star. A new DaVinci, Escher, or Picasso may also be discovered.

YOU NEED:

- 1 Norland Calculator Robot and TI-83 Plus
- 1 Clothes Peg, Marker
- Graph Paper
- Drawing Paper 18"X24"
- Program: **SCORPIO**



INSTRUCTIONS:

Alfred:

On your TI-83 Plus press the yellow [2nd] key and then press [ZOOM] for format. Scroll down with the arrow keys and highlight AxesOff. Press [ENTER]. Press the blue [Y=] key and enter the following equations:

```
Plot1 Plot2 Plot3
\Y1= -.5X^2+10
\Y2= -√(16-X^2)-5
\Y3= -4+√(1-(X+3)
2)
\Y4= -4+√(1-(X-3)
2)
\Y5= -√((1-X^2)-6
```

All keys are visible on the face of your graphing calculator. Be sure and distinguish between a negative and a subtraction sign. Don't leave out the ²) at end of equations three and four. Press the blue [GRAPH] key to see Alfred.

George:

Leave the setting as above. Press the blue [Y=] key and enter the following equations, then press the blue [GRAPH] key. Meet George.

```
Plot1 Plot2 Plot3
\Y1= -2√(X-2)+1
\Y2= -2√(-X-2)+1
\Y3= √(25-X^2)+5
\Y4= -√(25-X^2)+5
\Y5= -√(16-X^2)+6
\Y6= -4+√(1-(X+3)
2)+10
\Y7= -4+√(1-(X-3)
2)+10
\Y8= -√(1-X^2)+6
\Y9= -X^2-.25
\Y0=
```

Explosion:

Leave format setting as above. Press the yellow [2nd] key and then press [ZOOM]. Scroll down with the arrow keys and highlight 5:ZSquare. Press [ENTER]. Press the [MODE] key and then scroll down with the arrow keys and highlight **Pol**. Press [ENTER]. Press the blue [Y=] key and enter the following equations, then press the blue [GRAPH] key.

```

Plot1 Plot2 Plot3
\r1=6
\r2=8sin(11.5θ)
\r3=5tan(5.4θ)
\r4=
\r5=
\r6=

```

Make Your Own:

Press the yellow [2nd] key and then press [ZOOM]. Scroll down with the arrow keys and highlight 6:ZStandard. Press [ENTER]. Press the [MODE] key and then scroll down with the arrow keys and highlight **Func**. Press [ENTER]. Press the yellow [2nd] key and then press [ZOOM] for format. Scroll down with the arrow keys and highlight AxesOn. Press [ENTER].

Press the blue [Y=] key, delete any other entries, and then enter the following equations. When finished, press the blue [GRAPH] key and on graph paper draw what happens to the parabola as 3 is added and subtracted. Use a different color for each equation.

```

\Y1=X2
\Y2=X2+3
\Y3=X2-3

```

Insert parentheses around the second and third equations. Instead of squaring just X, square the whole expression. First predict what the graphs will look like, then press the blue [GRAPH] key and draw what happens to the parabola on graph paper.

```

\Y1=X2
\Y2=(X+3)2
\Y3=(X-3)2

```

Graph the following and show what happens to the parabola:

$$\begin{aligned} \backslash Y_1 &= X^2 \\ \backslash Y_2 &= .5X^2 \\ \backslash Y_3 &= .25X^2 \\ \backslash Y_4 &= -X^2 \end{aligned}$$

For straight lines, graph and draw the following linear equations:

$$\begin{aligned} \backslash Y_1 &= X \\ \backslash Y_2 &= X+3 \\ \backslash Y_3 &= X-3 \end{aligned}$$

Predict what the following absolute value equations will look like, then graph and draw them. (For absolute value press [MATH], arrow over to NUM, and select number 1. Press [ENTER]).

$$\begin{aligned} \backslash Y_1 &= \text{abs}(X) \\ \backslash Y_2 &= \text{abs}(X) + 3 \\ \backslash Y_3 &= \text{abs}(X) - 3 \end{aligned}$$

Try:

$$\begin{aligned} \backslash Y_1 &= \text{abs}(X) \\ \backslash Y_2 &= \text{abs}(X+3) \\ \backslash Y_3 &= \text{abs}(X-3) \end{aligned}$$

For a circle, press the yellow [2nd] key and then press [ZOOM]. Scroll down with the arrow keys and highlight 5:ZSquare. Press [ENTER]. Graph and draw the following circles and determine their radii and diameters:

$$\begin{aligned} \backslash Y_1 &= \sqrt{100 - x^2} \\ \backslash Y_2 &= -\sqrt{100 - x^2} \\ \backslash Y_3 &= \sqrt{16 - x^2} \\ \backslash Y_4 &= -\sqrt{16 - x^2} \end{aligned}$$

CHALLENGE:

Make your own creation on your TI-83 Plus using variations of the function equations above. Write down your equations for a partner and see if they can duplicate your design.

Circular Lines

Using the robot, paper, and marker draw a circle with the circumference of approximately 36 inches. This can be accomplished by attaching a marker 5.75 inches from the robot's pivot point. On most robots, a marker taped to the back is very close. (If necessary, see Mission 4 for more on robot circle drawing.)

After you've made your circle, put 36 dots evenly spaced (one inch apart) around the circumference. (Have I ever lead you astray? Trust me, you're going to like this.) Number the dots from zero to 35. Also, place the number 36 above the zero.

Make a solution table for the equation $Y=X+21$.

X	0	1	2	3	...
Y	21	22	23	24	...

On your "circle graph," use a straight line to connect 0 with 21, 1 with 22, 2 with 23, etc. Extend the solution table to $X=36$. In order to connect larger numbers, continue the number pattern around the outside of the circle. Your efforts will be rewarded by an intricate symmetrical pattern that can be enhanced by shading it with colored pencils.

The Robot Does the Work

Write the following program. Place your robot on a large sheet of paper with a marker on the back and have it ready to draw. Start the program. Hit the bumper to stop the robot when you're satisfied with your design.

```
PROGRAM:SCORPIO           :Send({320,10})
:Lbl A                   :Get (R)
:Send({321,10})          :If R<10:Goto B
:Get (R)                 :Goto A
:If R<10:Goto B          :Lbl B
```

ACTIVITY NOTES:

Alfred:



The activity provides a fun way to explore functions and an opportunity to extend concepts while encouraging artistic design.

George:



Explosion:

