

Name _____

Dynamical Grapher - LAB #2

Parametric Curves: Make a Halloween Mask!

- 1) A set of parametric equations for a curve C in the xy -plane is of the form $x = f(t)$ and $y = g(t)$, where $f(t)$ and $g(t)$ are expressions involving t and no other variables. This means that if we pick a value for t and plug it into these equations, the point we get, (x, y) , lies on the curve C .

Choose values for t to find 2 points on each parametric curve:

(a) $C_1: x = t, y = -4t - 15$

$$t = \underline{\hspace{2cm}} \Rightarrow (x_1, y_1) = \underline{\hspace{2cm}}$$

$$t = \underline{\hspace{2cm}} \Rightarrow (x_2, y_2) = \underline{\hspace{2cm}}$$

(b) $C_2: x = t, y = .25t^2$

$$t = \underline{\hspace{2cm}} \Rightarrow (x_1, y_1) = \underline{\hspace{2cm}}$$

$$t = \underline{\hspace{2cm}} \Rightarrow (x_2, y_2) = \underline{\hspace{2cm}}$$

- (c) Use the Dynamical Grapher to draw curves C_1 and C_2 . Check your answers to (a) and (b) by finding those points on the lines. (Look at “xcur” and “ycur” when you point to the drawing window.) You may have to change your window size and/or the range of t values to locate your points on the curves. After you are finished checking your answers, set your viewing window to $-10 \leq x \leq 10$, $0 \leq y \leq 20$ and the t values to be $t_{\min}=-8$, $t_{\max}=0$ for C_1 (the line) and $t_{\min}=-6.4$, $t_{\max}=6.4$ for C_2 (the parabola).

- 2) Since $x = t$ for both curves C_1 and C_2 we get the equation $y = -4x - 15$ for C_1 and $y = -.25x^2$ for C_2 . Using this idea, fill in the parametric equations for the following curves:

Regular Equations

C3: $y = 4x - 15$

C4: $y = .5x^2 + 3$

Parametric Equations

C3: $x = t$, $y = \underline{\hspace{2cm}}$

C4: $x = t$, $y = \underline{\hspace{2cm}}$

Enter these 2 sets of parametric equations into the Dynamical Grapher as curves C3 and C4 using

$t_{\min} = 0$ and $t_{\max} = 8$ for C3 and

$t_{\min} = -2$ and $t_{\max} = 2$ for C4.

3) Fill in the parametric equations for the following 2 vertical line segments:

Regular Equations

C5: $x = -1.5, 2.5 \leq y \leq 4.1$

C6: $x = 1.5, 2.5 \leq y \leq 4.1$

Parametric Equations

C5: $x = \underline{\hspace{2cm}}, y = t, t_{min} = 2.5, t_{max} = 4.1$

C6: $x = \underline{\hspace{2cm}}, y = t, t_{min} = \underline{\hspace{2cm}}, t_{max} = \underline{\hspace{2cm}}$

Enter these line segments as curves 5 and 6 in the Dynamical Grapher.

4) To make our Halloween mask we need to apply some functions to our curves.

(a) Using tabs F1-F4, enter the following 4 functions into the Dynamical Grapher:

$$f_1(x, y) = (-.25x - 3, -.25y + 10)$$

$$f_2(x, y) = (-.25x + 3, -.25y + 10)$$

$$f_3(x, y) = (-.2x + .08y - 6.5, -.08x - .2y + 14.4)$$

$$f_4(x, y) = (-.2x - .08y + 6.5, .08x - .2y + 14.4)$$

(b) Make the **settings on the curve tabs C1-C6** as follows:

- The “Showcurve” checkbox should be selected for all of the curves **except** C1 and C3.
- Select the function checkboxes 1-4 for **every** curve C1-C6.
- For curves C1 and C3 set Min = 2 and Max = 2 for both Functions 1 and 2.

5) Play around with the iterations (Min and Max) and the color selections to make your mask extra scary! (You may also wish to experiment with the function composition feature (the FC tab) and/or the graph trajectory feature as well.) Once you are satisfied with your Halloween mask, use “Take Screen Shot” (located under the “Actions” menu) to save a copy of your image as a .png file. Finally, print out your .png file. Viola! Your custom made mask is done!