

# Math 153 Calculus III Notes

## 10.1 Parametric Functions

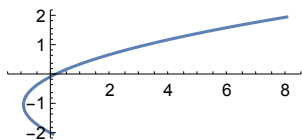
A parametric function is a where  $x$  and  $y$  are described by a function in terms of the parameter  $t$ :

$$(x, y) = \{x(t), y(t)\}, \text{ or}$$
$$x = f(t); y = g(t)$$

💡 **Example 1** Describe the graph given by  $x = t^2 - 2t$ ,  $y = t - 2$ , for  $0 \leq t \leq 4$ . (Create a table of points.) Also, set your calculator to **Parametric** mode; enter the functions, and set the appropriate **Window**.

⚙ **Mathematica Command :**

```
ParametricPlot[{t^2 - 2 t, t - 2}, {t, 0, 4}]
```




**Example 2** Find a parametrization of the line  $y = \frac{2}{3}x + 4$  without using fractions.

**Example 3** Find a parametrization for the line in example (2) so that the line passes through the point  $(3, 6)$  when  $t = 0$ .

**Example 4** Find a parametrization for the path of a particle moving along the parabola  $f(x) = 9 - x^2$  so that it moves from the right  $x$ -intercept to the left  $x$ -intercept for  $0 \leq t \leq 1$ .

**Example 5** Find a parametrization for the path of a particle moving from  $(0, 0)$  to  $(4, 0)$ , then along a circular arc from  $(4, 0)$  back to  $(0, 0)$  for  $0 \leq t \leq 2$ .

 **Example 6** Eliminate the parameter to write the function in rectangular coordinates:  $\{2 \cos(t) + 1, 4 \cos^2(t) + 2\}$  and describe the function for all  $t \geq 0$ .

**Example 7** Graph  $f(t) = \{\cos(3.5 t), \sin(2.8 t)\}$  on the interval  $t : [0, 12]$