

1. Describe and illustrate the variations of a circle as given below. Use radian mode and Zoom Square.

$$\text{a. } \begin{cases} x = 2 \cos t \\ y = 2 \sin t \end{cases} \\ 0 \leq t \leq 2\pi$$

$$\text{b. } \begin{cases} x = \cos(3t) \\ y = \sin(3t) \end{cases} \\ 0 \leq t \leq \frac{2\pi}{3}$$

$$\text{c. } \begin{cases} x = \cos(-t) \\ y = \sin(-t) \end{cases} \\ 0 \leq t \leq 2\pi$$

$$\text{d. } \begin{cases} x = \sin t \\ y = \cos t \end{cases} \\ 0 \leq t \leq 2\pi$$

$$\text{e. } \begin{cases} x = 3 + \cos t \\ y = -1 + \sin t \end{cases} \\ 0 \leq t \leq 2\pi$$

$$\text{f. } \begin{cases} x = 3 \cos t \\ y = 2 \sin t \end{cases} \\ 0 \leq t \leq 2\pi$$

2. Graph these parametric equations. Use radian mode. Then experiment with different values of the constants. What affect do these changes have on the graph?

$$\text{a. } \begin{cases} x = \sin(3t) \\ y = \sin(4t) \end{cases} \quad \begin{array}{l} 0 \leq t \leq 6.3 \\ \text{tstep} = 0.05 \\ -1 \leq x \leq 1 \\ -1 \leq y \leq 1 \end{array}$$

$$\text{b. } \begin{cases} x = 8 \cos t + 5 \cos(4t) \\ y = 8 \sin t - 5 \sin(4t) \end{cases} \quad \begin{array}{l} 0 \leq t \leq 2\pi \\ \text{tstep} = 0.05 \\ -15 \leq x \leq 15 \\ -15 \leq y \leq 15 \end{array}$$

$$\text{c. } \begin{cases} x = 2t + 3 \cos(3t) \\ y = t - 5 \cos t \end{cases} \quad \begin{array}{l} -10 \leq t \leq 10 \\ \text{tstep} = 0.05 \\ -20 \leq x \leq 20 \\ -10 \leq y \leq 12 \end{array}$$

$$\text{d. } \begin{cases} x = t^3 - t \\ y = -t^4 + t^2 \end{cases} \quad \begin{array}{l} -2 \leq t \leq 2 \\ \text{tstep} = 0.05 \\ -1 \leq x \leq 1 \\ -0.5 \leq y \leq 0.5 \end{array}$$

$$\text{e. } \begin{cases} x1 = t \\ y1 = \sqrt{1-t^2} + |t| \end{cases} \quad \begin{array}{l} -1 \leq t \leq 1 \\ \text{tstep} = 0.05 \\ -1.2 \leq x \leq 1.2 \\ -1 \leq y \leq 1.6 \end{array}$$

$$\begin{cases} x2 = t \\ y2 = -\sqrt{1-t^2} + |t| \end{cases}$$