Math 1166: Homework 7
Due: Thursday, March 28th

1) Consider a nonzero vector defined by the ordered pair (a, b). If $\|(a, b)\|$ is the magnitude of this vector, **use algebra** to explain why

$$\frac{(a, b)}{\|(a, b)\|}$$

is a new vector whose magnitude is 1 and whose direction is the same as (a, b).

2) Suppose you have a parametric plot defined by $x(t)$ and $y(t)$.

(a) Compare and contrast the plots of

$$\Big(x(t), y(t)\Big) \qquad \text{and} \qquad \Big(x(t-6), y(t-6)\Big).$$

(b) Suppose that there are two bugs whose positions are given by:

$$\text{bug}_1(t) = \Big(x(t), y(t)\Big) \qquad \text{and} \qquad \text{bug}_2 = \Big(x(t-6), y(t-6)\Big).$$

where t represents time in seconds. Describe what happens as t runs from 0 seconds to 36 seconds.

(c) Now suppose that there are two bugs whose positions are given by:

$$\text{bug}_1(t) = \Big(x(t), y(t)\Big) \qquad \text{and} \qquad \text{bug}_2 = \Big(x(t)-6, y(t)-6\Big).$$

where t represents time in seconds. Describe what happens as t runs from 0 seconds to 36 seconds.

3) Find the intersection of the lines

$$x_1(t) = -6 + 9t \qquad x_2(t) = 3 + t$$
$$y_1(t) = 3 - 2t \qquad y_2(t) = -4 - 2t$$

If $(x_1(t), y_1(t))$ gives the position of jogger_1 and $(x_2(t), y_2(t))$ gives the position of jogger_2, what is the significance of the point of intersection of these lines, from the perspective of the joggers?