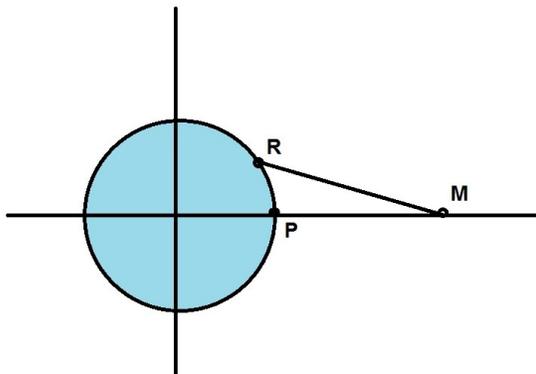


Math 124, Fall 2018, Solutions to Quiz 2

Pierre and Marie are out riding their bikes. At $t = 0$, Marie starts at point $M(24, 0)$ and rides towards the point $R(12, 5)$ in straight line with constant velocity at 26 kilometers per hour. Pierre starts riding his bike around the circular lake in a constant speed counterclockwise at $t = 0$ and they bump into each other at the point R .



1. Find parametric equations for Marie's motion.

$$x = at + b, y = ct + d$$

Distance from M to R is $\sqrt{12^2 + 5^2} = 13$ so it takes Marie 0.5 hours to get to point R .

At $t = 0$, $24 = x = b$ and $0 = y = d$.

At $t = 0.5$, $12 = x = a(0.5) + 24$ so $a = -24$.

At $t = 0.5$, $5 = y = c(0.5) + 0$ so $c = 10$.

$$x = -24t + 24 \quad y = 10t$$

2. Find parametric equations for Pierre's motion.

The center of the lake is at the origin so $a = b = 0$.

The radius of the lake is $r = \sqrt{12^2 + 5^2} = 13$.

So the equations are

$$x = 13 \cos(\omega t) \quad y = 13 \sin(\omega t)$$

At $t = 0.5$, $(x, y) = (12, 5)$ so, using of those coordinates $12 = 13 \cos(0.5\omega)$ we get $\omega = 2 \cos^{-1}(12/13) \approx 0.79$. Therefore,

$$x = 13 \cos(0.79t) \quad y = 13 \sin(0.79t)$$