A Bird Flies Home

Here we'll need to recall how to parameterize line segments from 2 points $\left(x_0, y_0\right)$ to $\left(x_1, y_1\right)$
as time varies from t_0 to t_1

$$x(t) = x_0 + \frac{\left(x_1 - x_0\right)}{t_1 - t_0} \cdot \left(t - t_0\right) \quad \text{and} \quad y(t) = y_0 + \frac{\left(y_1 - y_0\right)}{t_1 - t_0} \cdot \left(t - t_0\right)$$

For the trajectory of the pigeon over the water The bird flies $\sqrt{2}$ miles at 15mph so $t_1 - t_0 = .094$

$$x1(t) := \frac{1}{.094} \cdot t \quad \text{and} \quad y1(t) := 1 - \frac{1}{.094} \cdot t$$

For the path where the pigeon flies one mile over land then cuts over land the time it takes to fly
over land is $\frac{1}{35} = 0.02857$ and over water $\frac{1}{15} = 0.06667$:

$$x2(t) := \frac{1}{.02857} \cdot t + \Phi(t - .02857) \cdot \left(1 - \frac{1}{.02857} \cdot t\right) \quad \text{and}$$

$$y2(t) := 1 + \Phi(t - .02857) \cdot \left[1 - \frac{1}{.066} \cdot (t - .02857) - 1\right]$$

For the path where the bird flies .526 miles over land in time $\frac{.526}{35} = 0.015$ then flies on a line to pt B
over water a distance 1.107 miles in time $\frac{1.107}{15} = 0.074$:

$$x3(t) := .015 \cdot t + \Phi(t - .015) \cdot \left[.526 + \frac{(1 - .526)}{.074} \cdot (t - .015)\right]$$

$$y3(t) := 1 + \Phi(t - .015) \cdot \left[1 - \frac{1}{.074} \cdot (t - .015) - 1\right]$$

The Format is :

$$t := 0, .001.. \frac{FRAME}{1000}$$

$$x1(t) := \frac{1}{.094} \cdot t \qquad\qquad y1(t) := 1 - \frac{1}{.094} \cdot t$$

$$x2(t) := \frac{1}{.02857} \cdot t + \Phi(t - .02857) \cdot \left(1 - \frac{1}{.02857} \cdot t\right) \qquad y2(t) := 1 + \Phi(t - .02857) \cdot \left[1 - \frac{1}{.066} \cdot (t - .02857) - 1\right]$$

$$x3(t) := .015 \cdot t + \Phi(t - .015) \cdot \left[.526 + \frac{(1 - .526)}{.074} \cdot (t - .015)\right] \qquad y3(t) := 1 + \Phi(t - .015) \cdot \left[1 - \frac{1}{.074} \cdot (t - .015) - 1\right]$$

Use 95 frames since the max time it takes (path 2) is .095 hrs

$y1(t)$
$y2(t)$
$y3(t)$

$x1(t), x2(t), x3(t)$