The ship and the submarine

Here we have 2 animations:

1. The first shows the changing distance between the ship and the submarine

2. The second shows the depth charge being released and hitting the sub

The Changing Distance

Start by defining the time variable $T := \frac{FRAME}{100}$ this will give us time in increments of.01. since the time is in hours this is every .01 hrs

We need to plot the positions of the ship and the submarine

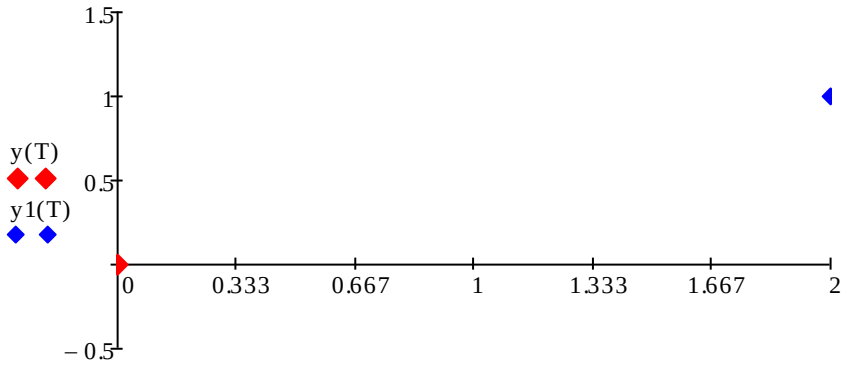
For the submarine we'll start it at the origin and since it is traveling 5mph $x(T) := 5 \cdot T$ and $y(T) := 0$

For the ship it starts 2 miles away and travels to the left at 10 mph. We'll use x1(T) for the ship since we used x(T) for the submarine $x1(T) := 2 - 10 \cdot T$ and $y1(T) := 1$

$T := \frac{FRAME}{100}$

$x(T) := 5 \cdot T \quad y(T) := 0$

$x1(T) := 2 - 10 \cdot T \quad y1(T) := 1$

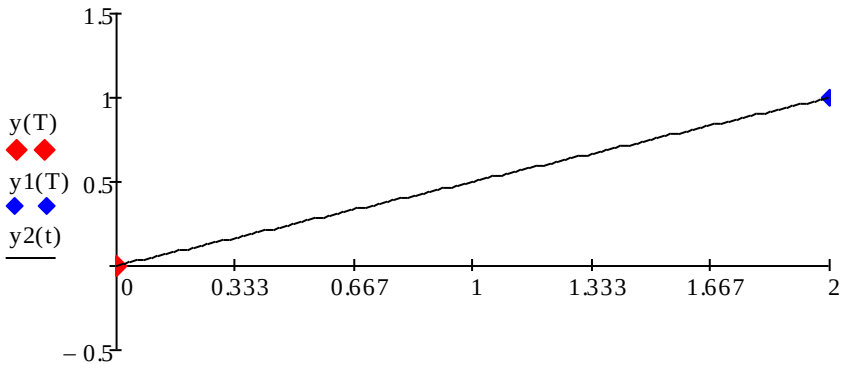


Now we want a line segment from the submarine to the ship We use

$t := 0, .01 .. 1$

$x2(t) := x(T) + (x1(T) - x(T)) \cdot t \qquad y2(t) := t$

If you forgot see the Basic Parametric Animations Notes on parameterizing line segments between 2 points.



Now Animate ! To show the ship passing over the sub 5T = 2 - 10T happens T = 2/15 =.133

Since we are consdiering.01 increments I'd use 14 frames at 1 frame/sec.

Bombing the sub

See the notes on bombing the sub. We saw that we need to release the bomb at t= 1/30 of an hour at the position x = 5/3.

We use the programming window and evaluation window. See basic graph notes for defining piecewise functions)

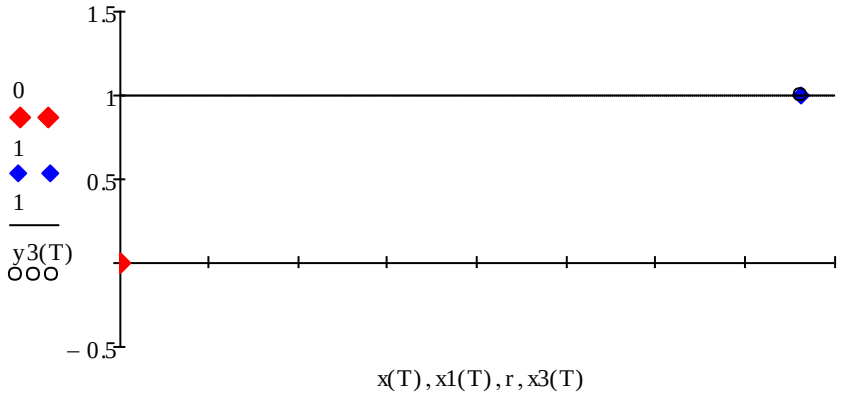
We also omit the line segment between the 2 for this animation

$$T := \frac{FRAME}{100}$$

$x(T) := 5 \cdot T \qquad y(T) := 0$

$x1(T) := 2 - 10 \cdot T \qquad y1(T) := 1$

$$x3(T) := \begin{cases} (2 - 10 \cdot T) & \text{if } T \le \frac{1}{30} \\ \frac{5}{3} & \text{otherwise} \end{cases} \qquad y3(T) := \begin{cases} 1 & \text{if } T \le \frac{1}{30} \\ (1 - 3 \cdot T) & \text{if } T > \frac{1}{30} \end{cases}$$



Now it's ready to animate. The depth charge hits the sub when $(1 - 3 \cdot T) = 0$

which yields T = .33 so use 33 Frames.