

## Shooting Curious George!

```
(Local) In[19]:=
Clear["Global`*"];
```

- **Initial conditions:**  $\{vx1,vy1\}$  = velocity of bullet,  
 $\{x2,y2\}$  = George position

```
(Local) In[20]:=
val = {vx1 # 100, vy1 # 100, x2 # 1000, y2 # 1000, g # 10};
```

- **Equations of motion in 2 dim with gravity**

```
(Local) In[21]:=
eq = {x''[t] # 0, y''[t] # -g};
```

- **Solve for bullet trajectory: get coordinates as function of t**

```
(Local) In[22]:=
init1 = {x[0] # 0, x'[0] # vx1, y[0] # 0, y'[0] # vy1};
dsol1 = DSolve[Join[eq, init1], {x[t], y[t]}, t][[1]]
```

```
(Local) Out[22]=
{x[t] # t vx1, y[t] #  $\frac{1}{2}(-g t^2 + 2 t vy1)$ }
```

```
(Local) In[23]:=
coord1[t_] = {x[t], y[t]} /. dsol1 /. val // Simplify
```

```
(Local) Out[23]=
{100 t, -5 (-20 + t) t}
```

- **Also get George's trajectory coordinates as function of t**

```
(Local) In[24]:=
init2 = {x[0] # x2, x'[0] # 0, y[0] # y2, y'[0] # 0};
dsol2 = DSolve[Join[eq, init2], {x[t], y[t]}, t][[1]]
```

```
(Local) Out[24]=
{x[t] # x2, y[t] #  $\frac{1}{2}(-g t^2 + 2 y2)$ }
```

```
(Local) In[25]:=
coord2[t_] = {x[t], y[t]} /. dsol2 /. val // Simplify
```

```
(Local) Out[25]=
{1000, -5 (-200 + t^2)}
```

### ■ Define a plot of the bullet and George as a function of t and tabulate it for ten t values from 0 to 10

```
(Local) In[26]:=
Clear[coordplot];
coordplot[t_] :=
  ListPlot[{coord1[t], coord2[t]}, PlotStyle  $\{$ PointSize[0.04], RGBColor[0, 0, 1] $\}$ ,
    GridLines  $\{$ Automatic, Frame  $\{$ True, PlotRange  $\{$ {0, 1000}, {0, 1000} $\}$ ]
```

```
(Local) In[28]:=
plotarray = Table[coordplot[tp], {tp, 0, 10, 1}];
```

### ■ Combine the ten plots into one plot

```
(Local) In[29]:=
Show[plotarray];
```

