

Coriolis Fictional Force Demonstration

```
(Local) In[63]:=
  Clear["Global`*"];
```

- Subject is at $r'=r$ and $\varphi'=0$ in a ref frame rotating at ω , rotating frame and laboratory coord are:

```
(Local) In[64]:=
  subjectrot[t_] = {r, 0};
  subjectlab[t_] = {r Cos[w t], r Sin[w t]};
```

- Subject throws ball at velocity v and angle α wrt to x axis, if ball is thrown at $t=0$ its initial velocities are:

```
(Local) In[66]:=
  vrot = {v Cos[a], v Sin[a]};
  vlab = vrot + {0, r w}
```

```
(Local) Out[67]=
  {v Cos[a], r w + v Sin[a]}
```

- Lab frame coord of ball trajectory is then:

```
(Local) In[68]:=
  balllab[t_] = subjectlab[0] + vlab t
```

```
(Local) Out[68]=
  {r + t v Cos[a], t (r w + v Sin[a])}
```

- Rotating frame coord of ball from rotation of lab frame coord:

```
(Local) In[69]:=
  rotate[t_] =
    {{Cos[w t], Sin[w t]}, {-Sin[w t], Cos[w t]}};
  ballrot[t_] = rotate[t].balllab[t]
```

```
(Local) Out[70]=
  {(r + t v Cos[a]) Cos[t w] + t (r w + v Sin[a]) Sin[t w],
   t Cos[t w] (r w + v Sin[a]) - (r + t v Cos[a]) Sin[t w]}
```

- Plot lab coord as a function of t and tabulate for ten t values, do the same for the rotating frame coord offset to $\{30,0\}$, then combine all t values in a single plot:

```
(Local) In[71]:=
  val = {r  $\mathbb{E}$  10, w  $\mathbb{E}$  Pi / 20, v  $\mathbb{E}$  1.5, a  $\mathbb{E}$  0};

(Local) In[72]:=
  Clear[plot];
  plot[t_] := ListPlot[{subjectlab[t], balllab[t], ballrot[t] + {30, 0}} /. val,
    PlotStyle  $\mathbb{E}$  {PointSize[0.03], RGBColor[0, 0, 1]}, GridLines  $\mathbb{E}$  Automatic,
    Frame  $\mathbb{E}$  True, PlotRange  $\mathbb{E}$  {{0, 50}, {-20, 20}}, AspectRatio  $\mathbb{E}$  Automatic]

(Local) In[74]:=
  plotarray = Table[plot[t], {t, 0, 10, 1}];

(Local) In[75]:=
  plotorigins = ListPlot[{{0, 0}, {30, 0}},
    PlotStyle  $\mathbb{E}$  {PointSize[0.03], RGBColor[1, 0, 0]}, GridLines  $\mathbb{E}$  Automatic,
    Frame  $\mathbb{E}$  True, PlotRange  $\mathbb{E}$  {{0, 50}, {-20, 20}}, AspectRatio  $\mathbb{E}$  Automatic];

(Local) In[76]:=
  points =
  Show[plotarray, plotorigins, Graphics[{{Text["Lab", {3, -2}], Text["RotF", {27, -2}]}]]];
```

