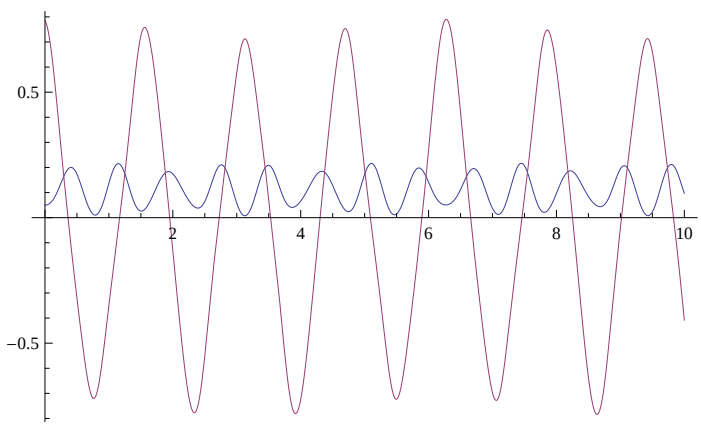
In[1]:=

```
g = 9.81;
alpha = π / 4;
m = 1.815;
l = 0.333;
Ft = 0;
k = 173;
sol = NDSolve[{
    m * r''[t] == m (l + r[t]) * theta'[t]^2 + m * g * Cos[theta[t]] - k * r[t],
    m (l + r[t]) * theta''[t] == -2 * m * r'[t] theta'[t] - m * g * Sin[theta[t]],
    r[0] == 0.05, r'[0] == 0, theta[0] == alpha, theta'[0] == -π / 8},
   {r[t], theta[t]}, {t, 0, 10}
  ];
```

In[8]:=

```
Plot[{Evaluate[r[t] /. sol][[1]], Evaluate[theta[t] /. sol][[1]]},
 {t, 0, 10}, PlotRange → Full]
```

Out[8]=



In[8]:=
```
Manipulate[
 {
  sol = NDSolve[{
     m * r''[t] == m (l + r[t]) * theta'[t]^2 + m * g * Cos[theta[t]] - k * r[t],
     m (l + r[t]) * theta''[t] == -2 * m * r'[t] theta'[t] - m * g * Sin[theta[t]],
     r[0] == 0.05, r'[0] == 0, theta[0] == alpha, theta'[0] == -π / 8},
    {r[t], theta[t]}, {t, 0, 10}
   ];
  Animate[
   Graphics[{
     Line[{
       {0, 0},
       {(l + Evaluate[r[u] /. sol][[1]]) * Sin[Evaluate[theta[u] /. sol][[1]]],
        -(l + Evaluate[r[u] /. sol][[1]]) * Cos[Evaluate[theta[u] /. sol][[1]]]}
      }],
     Blue,
     Disk[{(l + Evaluate[r[u] /. sol][[1]]) * Sin[Evaluate[theta[u] /. sol][[1]]],
       -(l + Evaluate[r[u] /. sol][[1]]) *
        Cos[Evaluate[theta[u] /. sol][[1]]]}, l / 10]
    }, PlotRange → {{-2 * l, 2 * l}, {-2 * l, 0}}]
   , {u, 0, tkon}]
 },
 {tkon, 0.1, 30},
 {alpha, 0, π / 2},
 {m, 0.01, 5},
 {l, 0.01, 1},
 {k, 1, 200}
]
```

Out[8]=