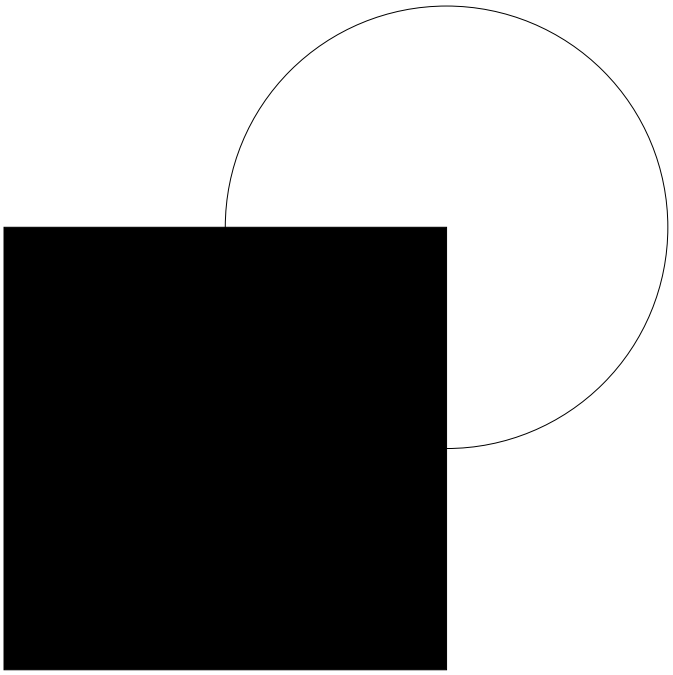
Графика

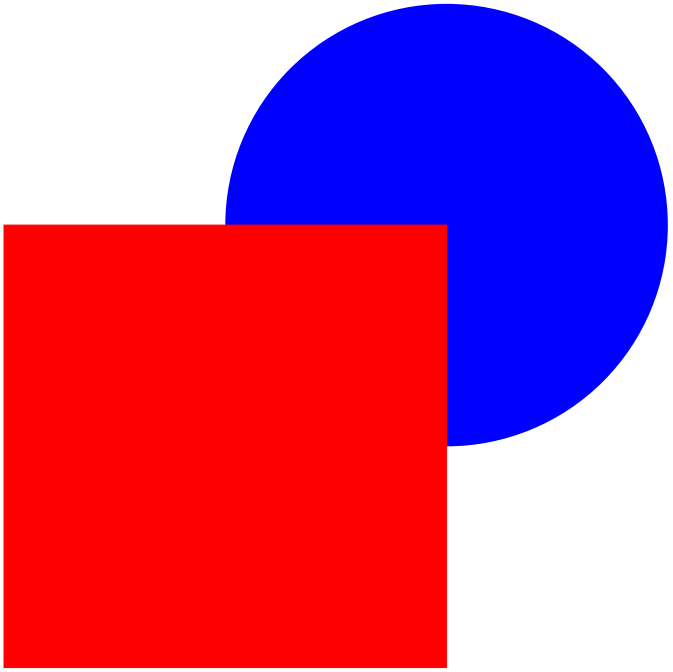
In[40]:=
```
Graphics[{
  Circle[{1, 1}, 1],
  Rectangle[{-1, -1}, {1, 1}],
 }]
```

Out[40]=

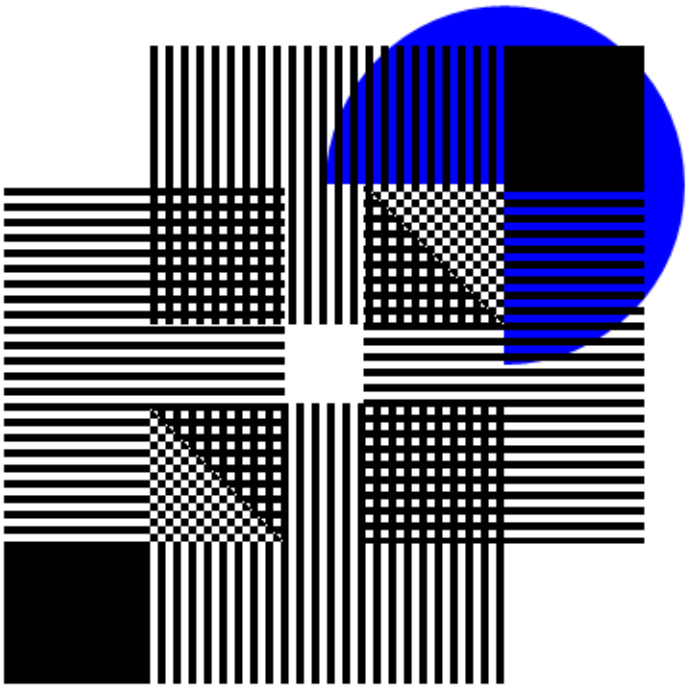


In[41]:=
```
Graphics[{
  Blue, Disk[{1, 1}, 1],
  Red,
  Rectangle[{-1, -1}, {1, 1}],
 }]
```

Out[41]=

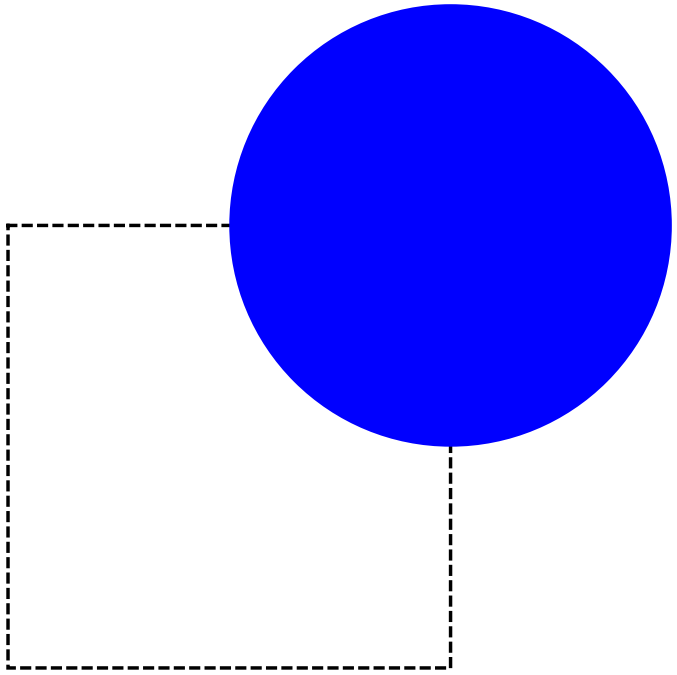


In[46]:=
```
Graphics[{
  Blue, Disk[{1, 1}, 1],
  White, EdgeForm[Directive[Thickness[.5], Dashed]],
  Rectangle[{-1, -1}, {1, 1}],
 }]
```



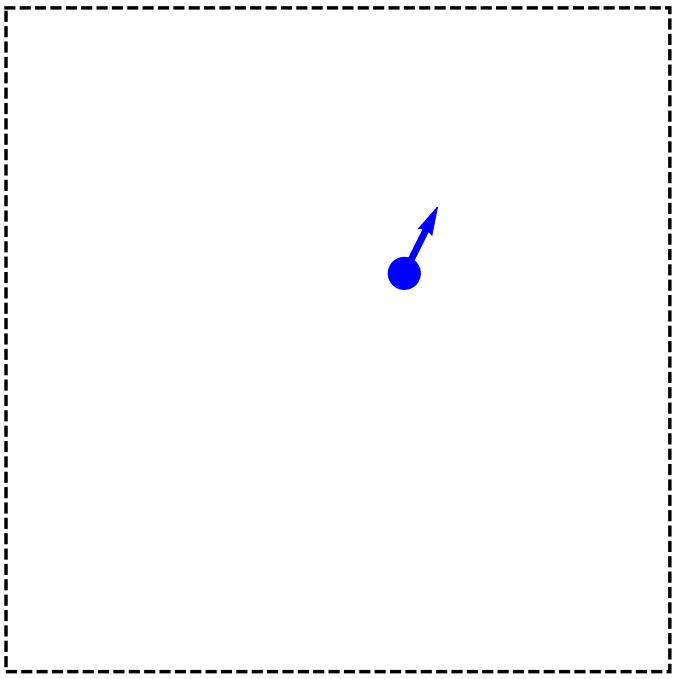
In[53]:=
```
Graphics[{
  White, EdgeForm[Directive[Thickness[.005], Dashed]],
  Rectangle[{-1, -1}, {1, 1}],
  EdgeForm[None],
  Blue, Disk[{1, 1}, 1]
 }]
```

Out[53]=



In[231]:=
```
Graphics[{
  White, EdgeForm[Directive[Thickness[.005], Dashed]],
  Rectangle[{-1, -1}, {1, 1}],
  EdgeForm[None],
  Blue, {{{Disk[.2 {1, 1}, .05]}}},
  Thickness[.01],
  Arrow[{.2 {1, 1}, {.3, .4}}]
 }]
```

Out[231]=



Цвета

In[223]:=
```
Blue
```

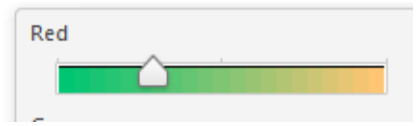
Out[223]=

In[224]:=
```
 // FullForm
```

Out[224]//FullForm=
```
RGBColor[0, 0, 1]
```

In[24]:=
```
RGBColor[.9, .2, .3]
```

In[26]:=



In[269]:=
```
RGBColor[.9, .2, .3, .4]
```

Out[269]=

In[32]:= **ColorData[3]**

Out[32]= ColorDataFunction[Index: 3 Colors: 10 Palette:]

In[30]:= **ColorData /@ Range[5]**

Out[30]= {ColorDataFunction[Index: 1 Colors: ∞ Palette:],
ColorDataFunction[Index: 2 Colors: 9 Palette:],
ColorDataFunction[Index: 3 Colors: 10 Palette:],
ColorDataFunction[Index: 4 Colors: 10 Palette:],
ColorDataFunction[Index: 5 Colors: 10 Palette:]}

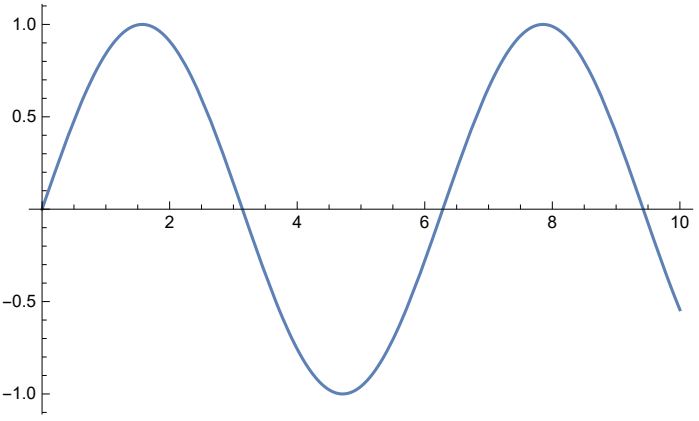
In[36]:= **ColorData[3][2]**

Out[36]=

Графики

In[155]:= **Plot[Sin[x], {x, 0, 10}]**

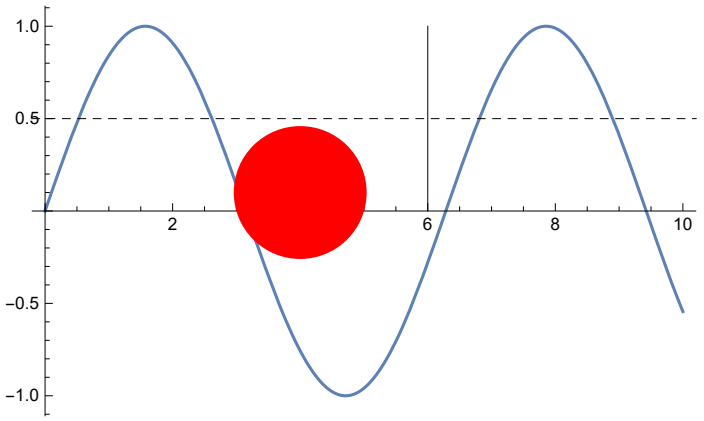
Out[155]=



In[156]:= **Plot[Sin[x], {x, 0, 10}] // FullForm**

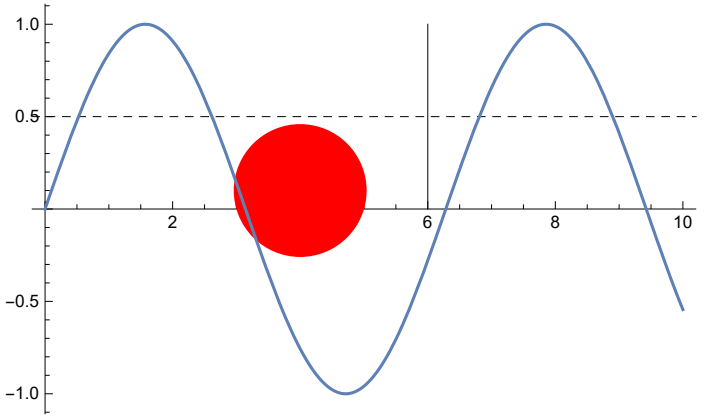
In[172]:=
```
Plot[Sin[x], {x, 0, 10}, Epilog → {Red, PointSize[.2], Point[{4, .1}],
    Black, Line[{{6, 0}, {6, 1}}],
    Dashed, InfiniteLine[{0, .5}, {1, 0}]
  }]
```

Out[172]=



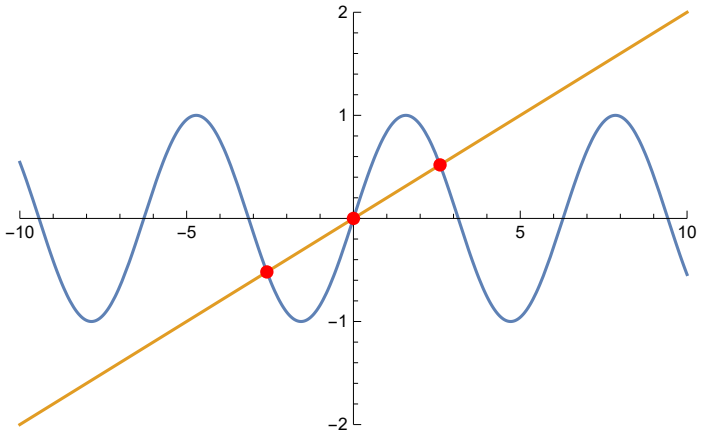
In[232]:=
```
Plot[Sin[x], {x, 0, 10}, Prolog → {Red, PointSize[.2], Point[{4, .1}],
    Black, Line[{{6, 0}, {6, 1}}],
    Dashed, InfiniteLine[{0, .5}, {1, 0}]
  }, Method → {"AxesInFront" → False}]
```

Out[232]=



In[189]:=
```
f1[x_] := Sin[x]; f2[x_] := x / 5;

sol = NSolve[f1[x] == f2[x], x, Reals];
list = {x, f1[x]} /. sol;

Plot[{f1[x], f2[x]}, {x, -10, 10}, PlotRange → {{-10, 10}, {-2, 2}},
 Epilog → {Red, PointSize[.02], Point /@ list}]
```

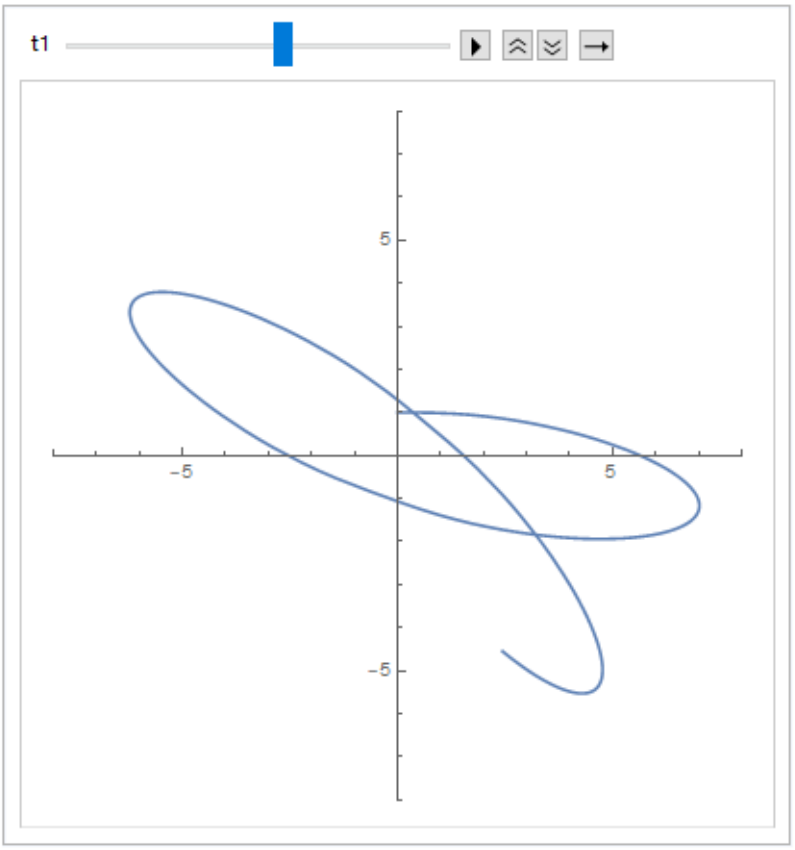
Out[192]=



Задача 3.3

In[292]:=
```
F[r_] := -1 / r + 1 / r^2;
T = 100;

sol = NDSolve[{
       x''[t] == F[r] x[t] / r, y''[t] == F[r] y[t] / r,
       x[0] == 0, x'[0] == 3 / 2,
       y[0] == 1, y'[0] == 0
      } /. r → √(x[t]^2 + y[t]^2) , {x, y}, {t, 0, T}][[1]];
```

In[295]:=
```
Animate[
 ParametricPlot[{x[t], y[t]} /. sol, {t, 0, t1}, PlotRange → 8 {{-1, 1}, {-1, 1}}],
 {t1, 0.001, T}]
```


t1
5
-5
5
-5

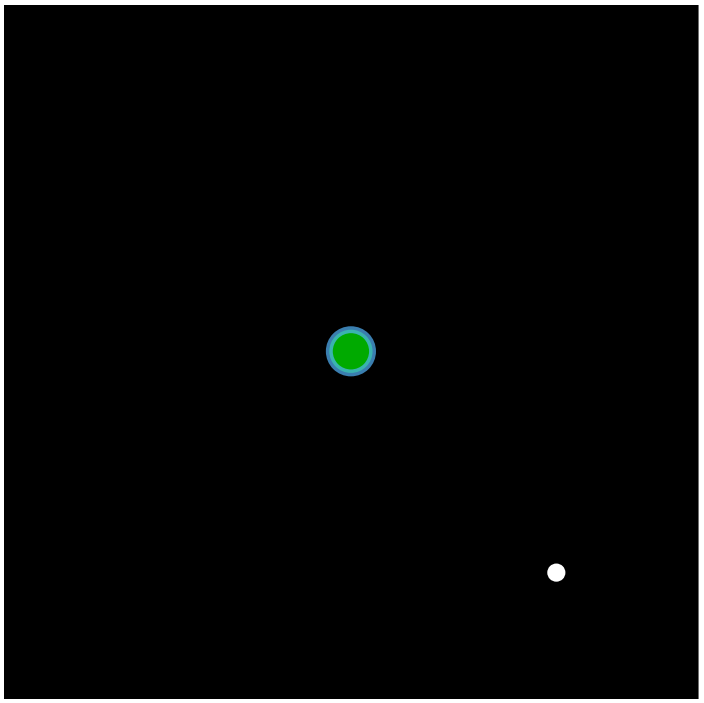
Анимация

In[387]:=
```
Graphics[{
  Disk[{x[t], y[t]}, .1] /. sol /. t → 2
 }
 , PlotRange → 8 {{-1, 1}, {-1, 1}}]
```

Out[387]=

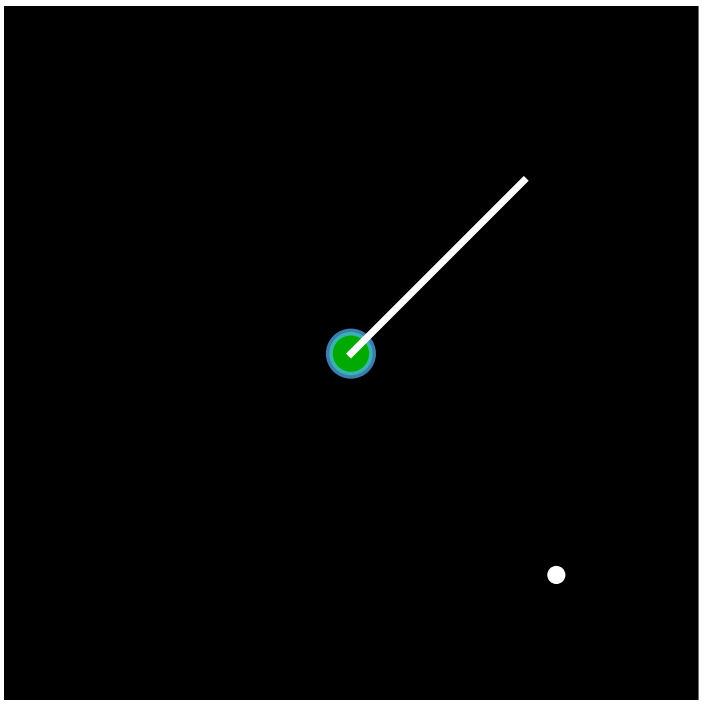
In[410]:=
```
pic[t_] :=
  Graphics[{Darker[Green], EdgeForm[Directive[ , Thickness[.01]]], Disk[{0, 0}, .5],
    White, EdgeForm[None], Disk[{x[t], y[t]}, .21] /. sol
   }
   , PlotRange → 8 {{-1, 1}, {-1, 1}}, Background → Black];

pic[T / 2]
```

Out[411]=

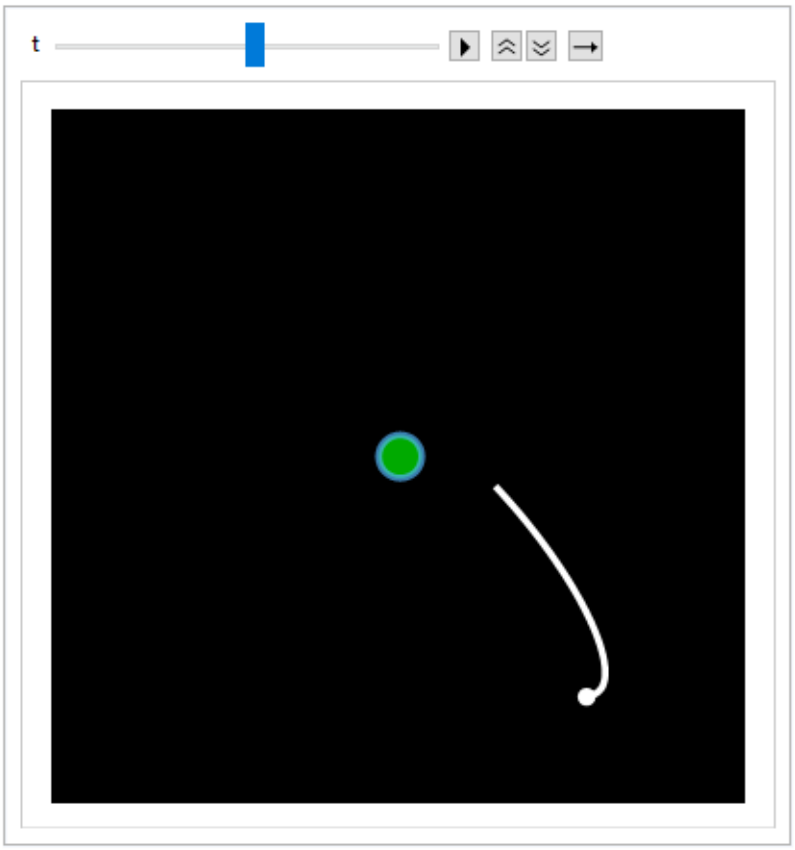


In[412]:=
```
pic[t_] :=
  Graphics[{Darker[Green], EdgeForm[Directive[, Thickness[.01]]], Disk[{0, 0}, .5],
    White, Thickness[.01], Line[{{0, 0}, {4, 4}}],
    EdgeForm[None], Disk[{x[t], y[t]}, .21] /. sol
   }
   , PlotRange → 8 {{-1, 1}, {-1, 1}}, Background → Black];

pic[T / 2]
```

Out[413]=

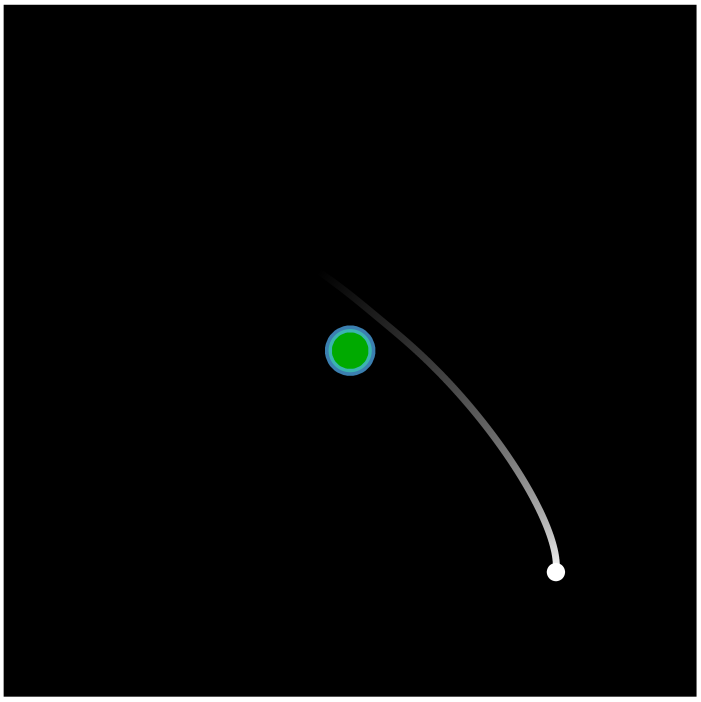


In[456]:=
```
pic[t_] :=
  Graphics[{Darker[Green], EdgeForm[Directive[, Thickness[.01]]], Disk[{0, 0}, .5],
    White, Thickness[.01],
    Line[{x[#], y[#]} /. sol & /@ Subdivide[Max[t - 10, 0], t, 100]],
    EdgeForm[None], Disk[{x[t], y[t]}, .21] /. sol
   }
   , PlotRange → 8 {{-1, 1}, {-1, 1}}, Background → Black];

Animate[pic[t], {t, 0, T}]
```

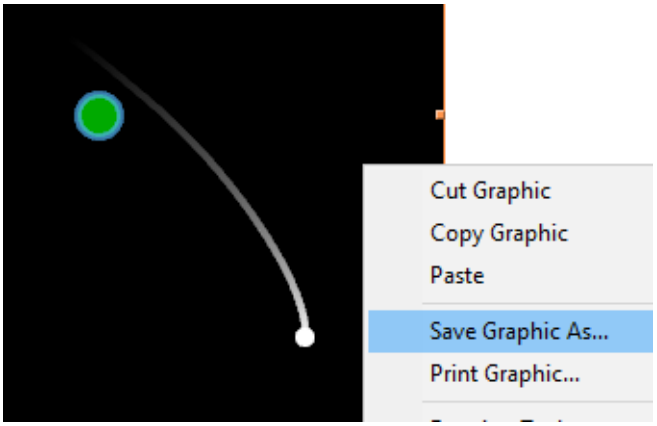

t

In[427]:=
```
np = 100;
pic[t_] :=
  Graphics[{Darker[Green], EdgeForm[Directive[ , Thickness[.01]]], Disk[{0, 0}, .5],
    White, Thickness[.01], Line[{x[#], y[#]} /. sol & /@ Subdivide[Max[t - 10, 0], t, np],
     VertexColors → (Opacity[#, White] & /@ Subdivide[0, 1, np])],
    EdgeForm[None], Disk[{x[t], y[t]}, .21] /. sol
   }
   , PlotRange → 8 {{-1, 1}, {-1, 1}}, Background → Black];

img = pic[T / 2]
```

Out[429]=



Экспорт



In[394]:=
```
Directory[]
```

In[392]:=
```
NotebookDirectory[]
```

In[393]:=
```
SetDirectory[NotebookDirectory[]]
```

In[395]:=
```
Directory[]
```

In[397]:=
```
FileNames[]
```

In[430]:=
```
Export["pic.pdf", img, "pdf"]
```

Out[430]= pic.pdf

In[431]:=
```
Export["pic.png", img, "png"]
```

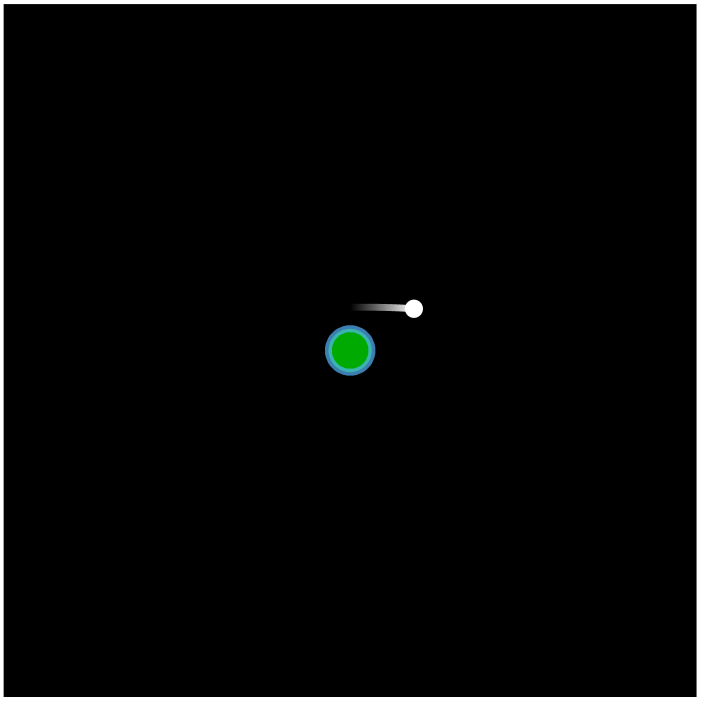
Out[431]= pic.png

In[432]:=
```
Export["pic.png", img, "png", ImageSize → 1000]
```

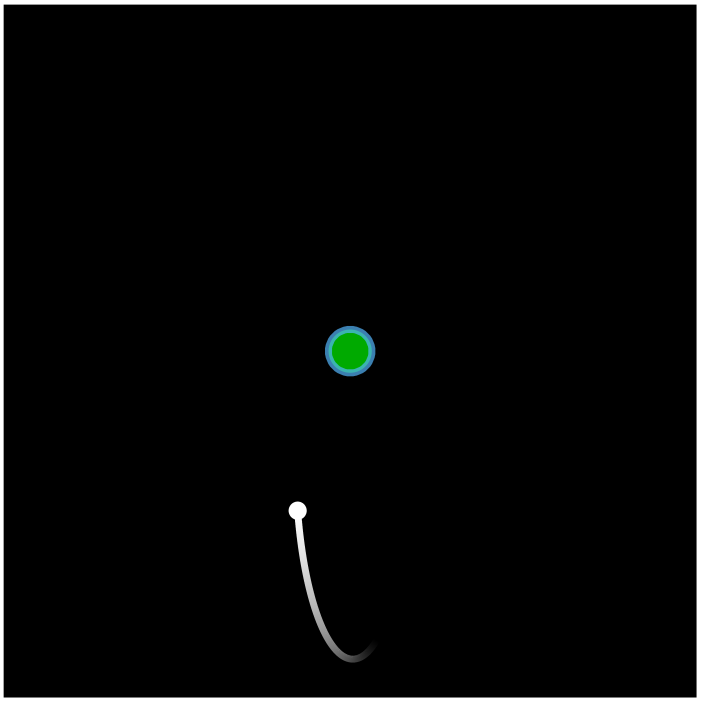
Out[432]= pic.png

In[441]:=
```
Pic[t_] := pic[t T];
pic[1]
Pic[1]
```

Out[442]=



Out[443]=



In[444]:=

Параметры анимации:

```
dirname = "animation_frames"; (*имя анимации*)
size = 250; (*разрешение кадра в пикселях*)
time = 5; (*время анимации в секундах*)
fps = 25; (*частота кадров*)
loop = False;(*зациклевание анимации*)
```

Покадровый экспорт в .png:

```
Nframes = Ceiling[fps time]; (*количество кадров*)
SetDirectory@NotebookDirectory[];
Quiet@CreateDirectory[dirname]; (*создание папки для сохранения кадров*)
Export[
    dirname <> "//frame" <> StringPadLeft[ToString[# - 1], 4, "0"] <> ".png", Rasterize[
     Pic[(# - 1)/(Nframes - Boole[! loop])], ImageSize → size], "png"] & /@ Range[Nframes];
```