

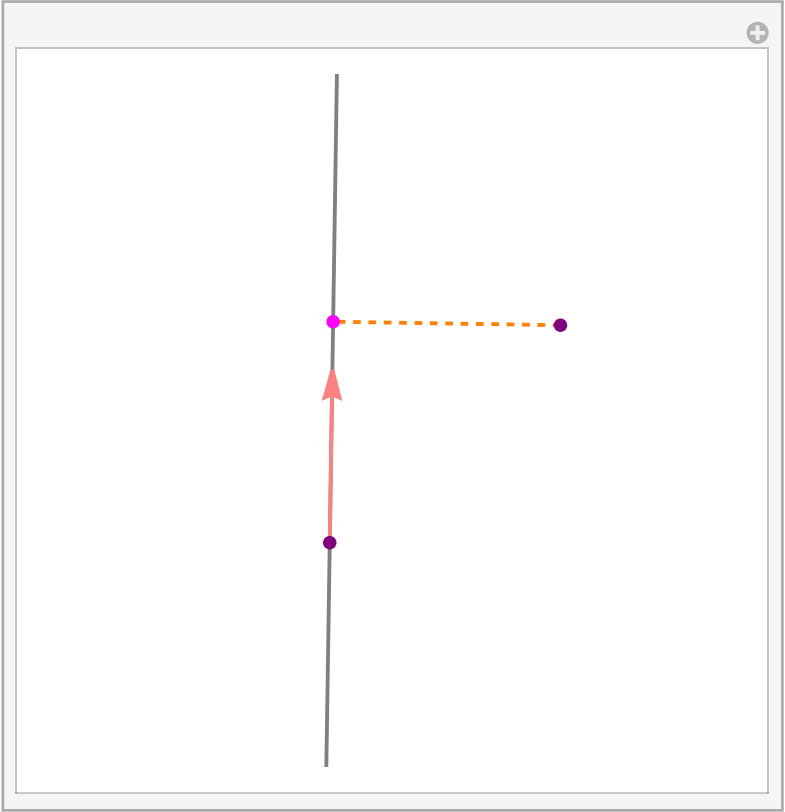
垂足曲线

计算过直线外一点的垂足点

```
In[*]:= cal[a_, p_, v_] := (p + v k) /. Solve[(p + v k - a).v == 0][[1]]
                                         |解方程

In[*]:= With[{rp = RandomPoint[Disk[]]}, Manipulate[x = cal[a, p, pv - p];
|With循环 |伪随机点 |圆盘 |交互式操作
Graphics[{Thick, Orange, {Dashed, Line[{a, x]}}, Gray, InfiniteLine[{p, pv}], Pink,
|图形 |粗 |橙色 |虚线 |线段 |灰色 |无限长直线 |粉色
Arrow[{p, pv}], Purple, PointSize[Large], Point[{a, p}], Magenta, Point[x],
|箭头 |紫色 |点的大小 |大 |点 |品红色 |点
Locator[Dynamic[a], Appearance -> None], Locator[Dynamic[p, (pv += # - p;
|定位器 |动态 |外观 |无 |定位器 |动态
p = #) &], Appearance -> None], Locator[Dynamic[pv, (pv = p + Normalize[# - p]) &],
|外观 |无 |定位器 |动态 |正规化
Appearance -> None]], PlotRange -> 2],
|外观 |无 |绘制范围
{{a, RandomPoint[Disk[]]}, ControlType -> None}, {{p, rp}, ControlType -> None},
|伪随机点 |圆盘 |控件类型 |无 |控件类型 |无
{{pv, rp + RandomPoint[Circle[]]}, ControlType -> None},
|伪随机点 |圆 |控件类型 |无
{{x, {0, 0}}, ControlType -> None}, SaveDefinitions -> True]]
|控件类型 |无 |保存定义 |真
```

Out[*]=



鼠标移动太快时动态计算的Locator会偏移

```
In[ ]:= ReIm[Exp[I RandomReal[2  $\pi$ ]]]
      |... |... |·| 伪随机实数
      RandomPoint[Disk[]]
      |伪随机点 |圆盘

Out[ ]:= {0.969517, -0.245024}

Out[ ]:= {0.613124, -0.121629}
```

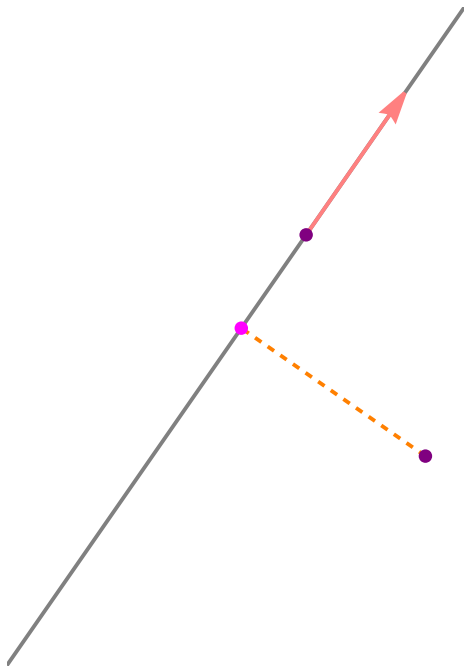
方式二(感觉更好, 更准确)

即使快速移动鼠标也不会有上面的问题

```

In[ ]:= DynamicModule[{a, p, pv, x}, a = RandomPoint[Disk[]];
|动态模块 |伪随机点 |圆盘
  p = RandomPoint[Disk[]];
|伪随机点 |圆盘
  pv = p + RandomPoint[Circle[]];
|伪随机点 |圆
  x = Dynamic@cal[a, p, pv - p];
|动态
  LocatorPane[Dynamic[{a, p, pv},
|定位器窗格 |动态
    Switch[CurrentValue["CurrentLocatorPaneThumb"], 1, a = #[[1]], 2, pv += #[[2]] - p;
|切换 |当前值
      p = #[[2]],
      3, pv = p + Normalize[#[[3]] - p] &],
|正规化
    Dynamic@Graphics[{Thick, Orange, {Dashed, Line[{a, x]}}, Gray,
|动态 |图形 |粗 |橙色 |虚线 |线段 |灰色
      Infiniteline[{p, pv}], Pink, Arrow[{p, pv}], Purple, PointSize[Large],
|无限长直线 |粉色 |箭头 |紫色 |点的大小 |大
      Point[{a, p}], Magenta, Point[x]}, PlotRange -> 2], Appearance -> None
|点 |品红色 |点 |绘制范围 |外观 |无
  ]]
```

Out[]:=



垂足曲线

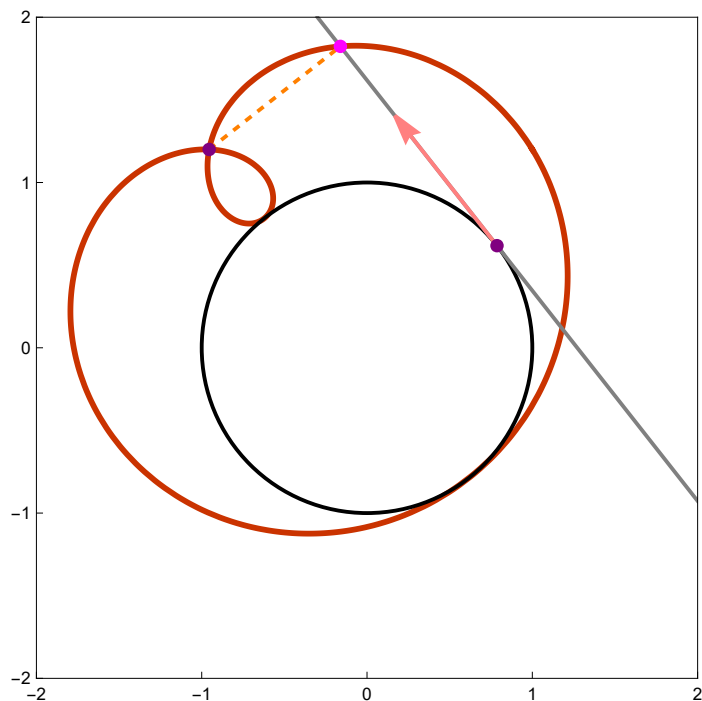
圆

```

In[ ]:= DynamicModule[{a, p, pv, x}, a = RandomPoint[Disk[]];
  |动态模块 |伪随机点 |圆盘
  p = RandomPoint[Circle[]];
  |伪随机点 |圆
  pv = Dynamic[p + {-p[[2]], p[[1]]}];
  |动态
  x = Dynamic[Cal[a, p, {-p[[2]], p[[1]]}]];
  |动态
  LocatorPane[Dynamic[{a, p}], Switch[
    |定位器窗格 |动态 |切换
    CurrentValue["CurrentLocatorPaneThumb"], 1, a = #[[1]], 2, p = Normalize[#[[2]]] &],
    |当前值 |正规化
    Dynamic@Show[ParametricPlot[Cal[a, {Cos[θ], Sin[θ]}, {-Sin[θ], Cos[θ]}],
      |动态 |显示 |绘制参数图 |余弦 |正弦 |正弦 |余弦
      {θ, 0, 2 π}, PlotRange → 2, PlotTheme → "Web"], Graphics[{Thick, Circle[], Orange,
        |绘制范围 |绘图主题 |图形 |粗 |圆 |橙色
        {Dashed, Line[{a, x]}}, Gray, InfiniteLine[{p, pv}], Pink, Arrow[{p, pv}],
        |虚线 |线段 |灰色 |无限长直线 |粉色 |箭头
        PointSize[Large], Purple, Point[{a, p}], Magenta, Point[x]}], Appearance → None
        |点的大小 |大 |紫色 |点 |品红色 |点 |外观 |无
    ]]]

```

Out[]:=



圆关于任意点的垂足曲线是蜗线（蚌线）

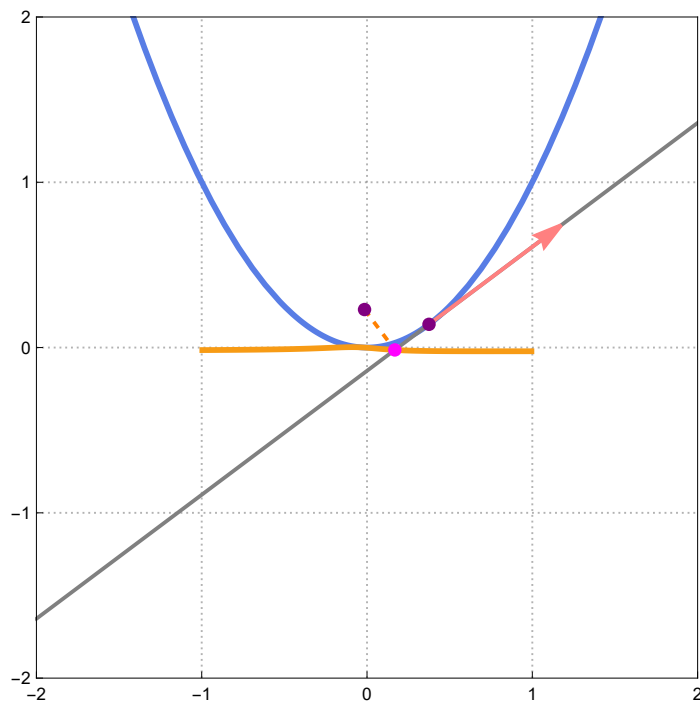
抛物线

```

In[ ]:= DynamicModule[{a, p, pv, x}, a = RandomPoint[Disk[]];
  动态模块 伪随机点 圆盘
  p = With[{k = RandomReal[{-1.5, 1.5}]}, {k, k^2}];
  With循环 伪随机实数
  pv = Dynamic[p + Normalize@{1, 2 p[[1]]}];
  动态 正规化
  x = Dynamic@cal[a, p, {1, 2 p[[1]]}];
  动态
  LocatorPane[Dynamic[{a, p}, Switch[CurrentValue["CurrentLocatorPaneThumb"],
    定位器窗格 动态 切换 当前值
    1, a = #[[1]], 2, p = With[{k = #[[2, 1]]}, {k, k^2}]] &],
    With循环
  Dynamic@Show[ParametricPlot[{{t, t^2}, cal[a, {t, t^2}, {1, 2 t}]}, {t, -2, 2},
    动态 显示 绘制参数图
    PlotRange -> 2, PlotTheme -> "Business"], Graphics[{Thick, Orange,
    绘制范围 绘图主题 图形 粗 橙色
    {Dashed, Line[{a, x]}}, Gray, InfiniteLine[{p, pv}], Pink, Arrow[{p, pv}],
    虚线 线段 灰色 无限长直线 粉色 箭头
    PointSize[Large], Purple, Point[{a, p}], Magenta, Point[x]}], Appearance -> None
    点的大小 大 紫色 点 品红色 点 外观 无
  ]]]

```

Out[]:=



抛物线关于其焦点的垂足曲线是直线

三次函数

```

In[ ]:= DynamicModule[{a, p, pv, x}, a = RandomPoint[Disk[]];
  [动态模块] [伪随机点] [圆盘]

  p = With[{k = RandomReal[{-1, 1}]}, {k, k^3}];
  [With循环] [伪随机实数]

  pv = Dynamic[p + {1, 3 (p[[1])^2}];
  [动态]

  x = Dynamic@cal[a, p, {1, 3 (p[[1])^2}];
  [动态]

  LocatorPane[Dynamic[{a, p}], Switch[CurrentValue["CurrentLocatorPaneThumb"],
  [定位器窗格] [动态] [切换] [当前值]

    1, a = #[[1], 2, p = With[{k = #[[2, 1]]}, {k, k^3}]] &,
    [With循环]

    Dynamic@Show[ParametricPlot[{x, x^3}, cal[a, {x, x^3}, {1, 3 x^2}]], {x, -2, 2},
    [动态] [显示] [绘制参数图]

    PlotRange -> 2, PlotTheme -> "Business"], Graphics[{Thick, Orange,
    [绘制范围] [绘图主题] [图形] [粗] [橙色]

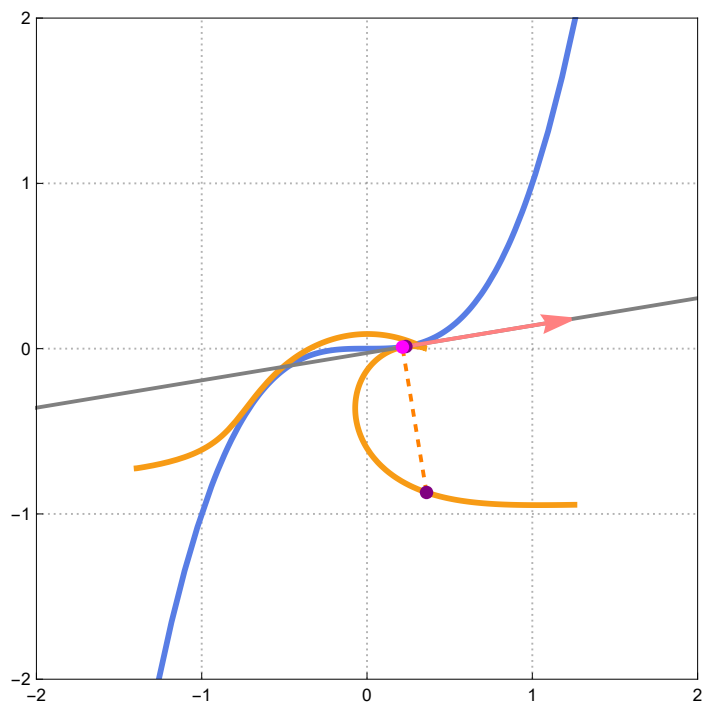
    {Dashed, Line[{a, x]}}, Gray, InfiniteLine[{p, pv}], Pink, Arrow[{p, pv}],
    [虚线] [线段] [灰色] [无限长直线] [粉色] [箭头]

    PointSize[Large], Purple, Point[{a, p}], Magenta, Point[x]}], Appearance -> None
    [点的大小] [大] [紫色] [点] [品红色] [点] [外观] [无]

  ]]]

```

Out[]:=



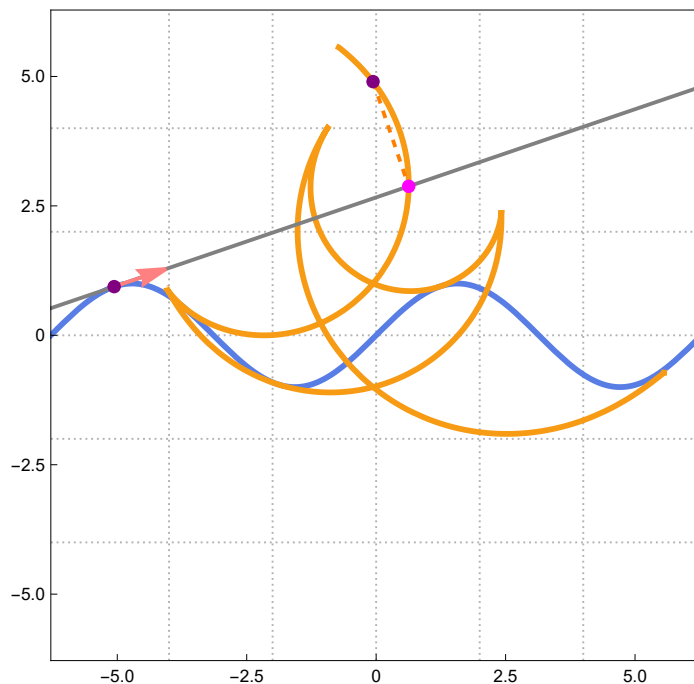
正弦函数

```

In[ ]:= DynamicModule[{a, p, pv, x}, a = RandomPoint[Disk[]];
  [动态模块] [伪随机点] [圆盘]
  p = With[{k = RandomReal[{-1, 1}]}, {k, Sin[k]}];
  [With循环] [伪随机实数] [正弦]
  pv = Dynamic[p + {1, Cos[p[[1]]]}];
  [动态] [余弦]
  x = Dynamic@cal[a, p, {1, Cos[p[[1]]]}];
  [动态] [余弦]
  LocatorPane[Dynamic[{a, p}], Switch[CurrentValue["CurrentLocatorPaneThumb"],
    [定位器窗格] [动态] [切换] [当前值]
    1, a = #[[1]], 2, p = With[{k = #[[2, 1]]}, {k, Sin[k]}]] &],
    [With循环] [正弦]
  Dynamic@Show[ParametricPlot[{{x, Sin[x]}, cal[a, {x, Sin[x]}, {1, Cos[x]}]},
    [动态] [显示] [绘制参数图] [正弦] [正弦] [余弦]
    {x, -2  $\pi$ , 2  $\pi$ }, PlotRange  $\rightarrow$  2  $\pi$ , PlotTheme  $\rightarrow$  "Business"], Graphics[{Thick, Orange,
      [绘制范围] [绘图主题] [图形] [粗] [橙色]
      {Dashed, Line[{a, x]}}, Gray, InfiniteLine[{p, pv}], Pink, Arrow[{p, pv}],
      [虚线] [线段] [灰色] [无限长直线] [粉色] [箭头]
      PointSize[Large], Purple, Point[{a, p}], Magenta, Point[x]}], Appearance  $\rightarrow$  None
      [点的大小] [大] [紫色] [点] [品红色] [点] [外观] [无]
    ]]]

```

Out[]:=



喜欢的话点个赞呗!