

椭圆的切线与圆的关系

```
In[*]:= a = 5; (*半长轴*)
b = 4; (*半短轴*)
c =  $\sqrt{a^2 - b^2}$ ; (*半焦距*)
r = 2 a; (*圆的半径*)

C1 = {0, 0}; (*圆心*)
C2 = {c, 0}; (*椭圆的中心点*)
F1 = C1; (*左焦点*)
F2 = {2 c, 0}; (*右焦点*)

P = {0, 0}; (*椭圆上的点*)
Q = {0, 0}; (*线段F1P的延长线与圆的交点*)
B = {0, 0}; (*线段F2Q的中点*)

L = {1, 1}; (*定位器的坐标点*)
```

```
In[*]:= style = {ImageSize → Large,
                 |图像尺寸| |大|
               Axes → True,
                 |坐标轴| |真|
               AxesLabel → {"x", "y"},
                 |坐标轴标签|
               PlotRange → {{-r - 1, r + 7}, {-r - 1, r + 1}},
                 |绘制范围|
               GridLines → Automatic,
                 |网格线| |自动|
               GridLinesStyle → Directive[Orange, Dashed]
                 |网格线样式| |指令| |橙色| |虚线|
               };
```

动态计算P, Q, B的坐标

```

In[*]:= calc[v_, p_] := With[{vx = v[[1]], vy = v[[2]]},
    |With循环

    m = Module[{x, y}, {x, y} /. NSolve[{ $\frac{(x - c)^2}{a^2} + \frac{y^2}{b^2} == 1$ , y vx == vy x}, {x, y}]];
    |模块 |数值求解

    P = Select[m, VectorAngle[#, v] < 0.1 &][[1]];
    |选择 |向量角度

    m = Module[{x, y}, {x, y} /. NSolve[{x^2 + y^2 == r^2, y P[[1]] == x P[[2]]}, {x, y}]];
    |模块 |数值求解

    Q = Nearest[m, P][[1]];
    |最接近

    B =  $\frac{Q + F_2}{2}$ ;
    L = v
]
SetAttributes[calc, HoldRest];
|设置特征 |不计算其余参数
calc[L]; (*计算P,Q,B点的坐标*)
Dynamic[{P, Q, B}]
|动态

Out[*]:= {P, Q, {b, 0}}

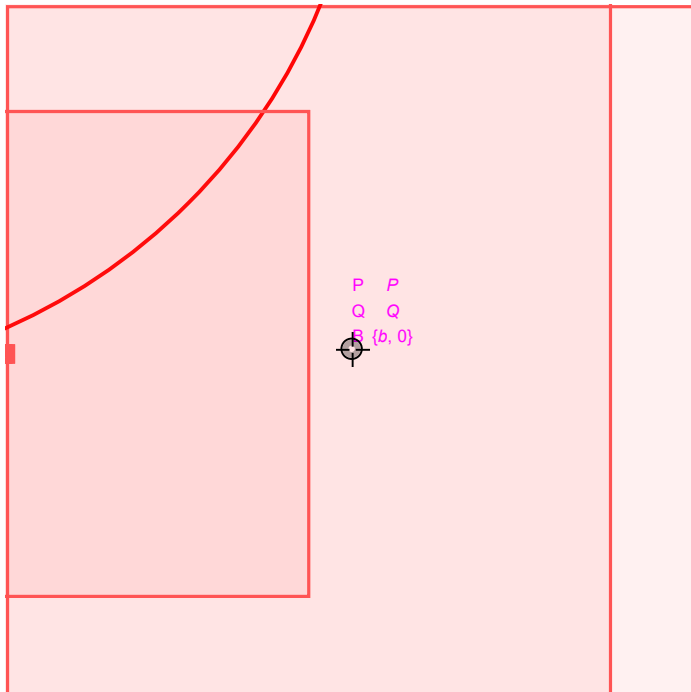
```

交互式图形显示

```

In[*]:= LocatorPane[Dynamic[L, calc],
  |定位器窗格 |动态
  Dynamic[Graphics[{
    |动态 |图形
    Thick, Red, Circle[C1, 10],
    |粗 |红色 |圆
    Green, Circle[C2, {5, 4}],
    |绿色 |圆
    Black, Line[{F1, Q}, {F2, Q}, {F2, P}],
    |黑色 |线段
    Purple, InfiniteLine[{P, B}],
    |紫色 |无限长直线
    PointSize[0.01], Point@ {F1, F2, C2},
    |点的大小 |点
    Pink, PointSize[0.02], Point[{P, Q, B}],
    |粉色 |点的大小 |点
    Text["F1", F1 + {0, -1}],
    |文本
    Text["F2", F2 + {0, -1}],
    |文本
    Text["P", P + {0, -1}],
    |文本
    Text["Q", Q + {0, -1}],
    |文本
    Text["B", B + {0, -1}],
    |文本
    Magenta, Inset[Grid[{{"P", P}, {"Q", Q}, {"B", B}}], {11, 1}, {Left, Bottom}]
    |品红色 |插图 |格子 |左 |底部
  }, style]]
]

```

$Out[*]=$ 

优化(2021/11/20)

```

In[*]:= DynamicModule[{pt = {1, 1}, P, Q, B},
  |动态模块

  LocatorPane[Dynamic[pt],
  |定位器窗格 |动态

  Dynamic[Graphics[{
  |动态 |图形

    t = Sign[pt[[2]] VectorAngle[pt, {1, 0}]];
    |正负符号 |向量角度

    P = Select[{x, y} /. NSolve[ $\frac{(x - c)^2}{a^2} + \frac{y^2}{b^2} = 1$  && y pt[[1]] == pt[[2]] x, {x, y}]],
    |选择 |数值求解

    VectorAngle[#, pt] < 0.1 &]][1];
    |向量角度

    Q = r {Cos[t], Sin[t]};
    |余弦 |正弦

    B =  $\frac{Q + F_2}{2}$ ;

    Thick, Red, Circle[C1, 10],
    |粗 |红色 |圆

    Green, Circle[C2, {5, 4}],
    |绿色 |圆

    Black, Line@{F2, Q},
    |黑色 |线段

    Gray, Line@{{F1, Q}, {F2, P}},
    |灰色 |线段

    Purple, InfiniteLine[{P, B}],
    |紫色 |无限长直线

    PointSize[0.01], Point@{F1, F2, C2},
    |点的大小 |点

    Pink, PointSize[0.02], Point[{P, Q, B}],
    |粉色 |点的大小 |点

    Text["F1", F1 + {0, -1}],
    |文本

    Text["F2", F2 + {0, -1}],
    |文本

    Text["P", P + {0, -1}],
    |文本

    Text["Q", 1.07 Q],
    |文本

    Text["B", B + {0, -1}],
    |文本

    Magenta, Inset[Grid[{{"P", P}, {"Q", Q}, {"B", B}}], {11, 1}, {Left, Bottom}]
    |品红色 |插图 |格子 |左 |底部

  }, style]],

  Appearance → None
  |外观 |无

]]

```

Out[*]=

