Simple Task 9

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1.

```
(*This dynamic module displays a slider and a graph
 with two points: one red one which corresponds the the x-
   value chosen on the slider and the y value of that x from the given function,
and one green point which stays on the y-axis and displays the y-
 value of the red point.*)

moveTwoPoints[fun_, {xmin_, xmax_}] :=
 DynamicModule[{sliderValue = (xmin + xmax)/2},
  (*The slider starts in the middle of the given range.*)
  Column[{Slider[Dynamic[sliderValue], {xmin, xmax}],
    (*Dynamic[sliderValue],*)
    Dynamic[Show[Plot[fun[x], {x, xmin, xmax}],
      Graphics[{Green, PointSize → Medium, Point[{0, fun[Dynamic[sliderValue]]}],
        Red, Point[{Dynamic[sliderValue], fun[Dynamic[sliderValue]]}]}]
     ]
    ]
   ]
  }]
 ]
```

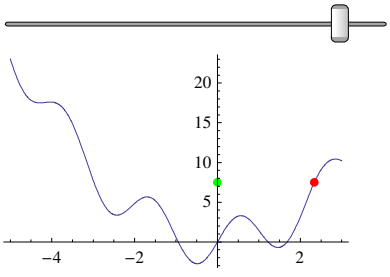
In[87]:=

```
testFun[x_] := 3 Sin[3 x] + x^2
```

In[89]:=

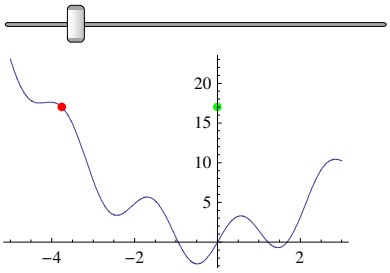
```
moveTwoPoints[testFun, {-5, 3}]
```

Out[89]=



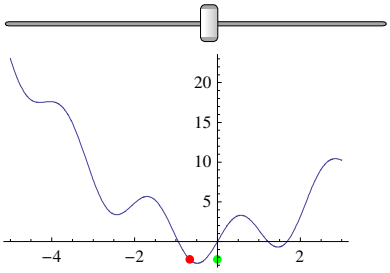
In[90]:=
```
moveTwoPoints[testFun, {-5, 3}]
```

Out[90]=



In[91]:=
```
moveTwoPoints[testFun, {-5, 3}]
```

Out[91]=



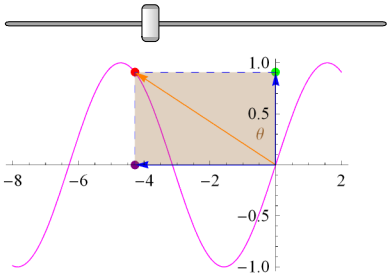
Playing around...

In[269]:=
```
moveThreePointsandVectors[fun_, {xmin_, xmax_}] :=
 DynamicModule[{sliderValue = (xmin + xmax)/2, theta},
  (*finds the angle--works for all quadrants
   since the angle labeling changes!*)
  theta = ArcTan[Abs[Dynamic[sliderValue]]/Abs[fun[Dynamic[sliderValue]]]];
  Column[{Slider[Dynamic[sliderValue], {xmin, xmax}],
    (*Dynamic[sliderValue],*)
    Dynamic[Show[Plot[fun[x], {x, xmin, xmax}, PlotStyle → {Magenta}],
      Graphics[{Green, PointSize → Medium,
        (*points*)
        Point[{0, fun[Dynamic[sliderValue]]}],
        Purple, Point[{Dynamic[sliderValue], 0}], Red,
        Point[{Dynamic[sliderValue], fun[Dynamic[sliderValue]]}],
        (*rectangle*)
        Brown, EdgeForm[Directive[Thin, Dashed, Blue]], FaceForm[Opacity[.3]],
        Rectangle[{0, 0}, {Dynamic[sliderValue], fun[Dynamic[sliderValue]]}],
        (*label theta placement relative to rectangle size*)
        Inset["θ", {Dynamic[sliderValue]/9, fun[Dynamic[sliderValue]]/3}],
        (*vector fun!*)
        Orange,
        Arrow[{{0, 0}, {Dynamic[sliderValue], fun[Dynamic[sliderValue]]}}],
        Blue,
        Arrow[{{0, 0}, {Dynamic[sliderValue], 0}}],
        Arrow[{{0, 0}, {0, fun[Dynamic[sliderValue]]}}]
       }]
     ],
    "θ = " theta
   }]
 ]
```

In[270]:=

```
fxn1[x_] := Sin[x]
moveThreePointsandVectors[fxn1, {-8, 2}]
```

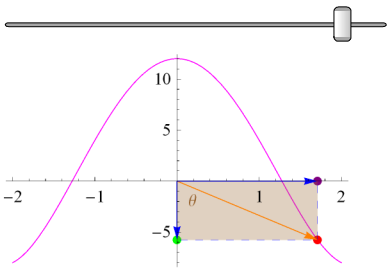
Out[271]=



$$\theta = \text{ArcTan}\left[\frac{\text{Abs}[-4.28]}{\text{Abs}[\text{Sin}[-4.28]]}\right]$$

```
fxn2[x_] := x^4 - 9 x^2 + 12
moveThreePointsandVectors[fxn2, {-2, 2}]
```

Out[257]=

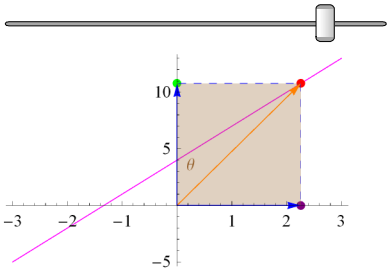


$$\theta = \text{ArcTan}\left[\frac{\text{Abs}[1.71]}{\text{Abs}\left[12-9\,1.71^2+1.71^4\right]}\right]$$

In[261]:=

```
fxn3[x_] := 3 x + 4
moveThreePointsandVectors[fxn3, {-3, 3}]
```

Out[262]=



$$\theta = \text{ArcTan}\left[\frac{\text{Abs}[2.26]}{\text{Abs}[4+3\,2.26]}\right]$$