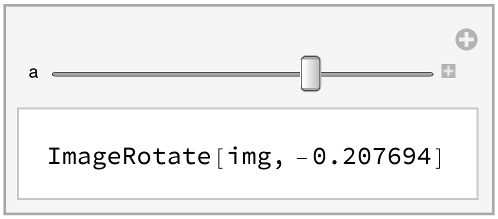
This program calculates the curvature of a select curve based off of the picture

```
ClearAll;
```

img = ;

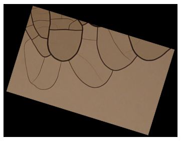
```
Manipulate[ImageRotate[img, -a Degree], {a, -30, 30}]
```

Out[●]=

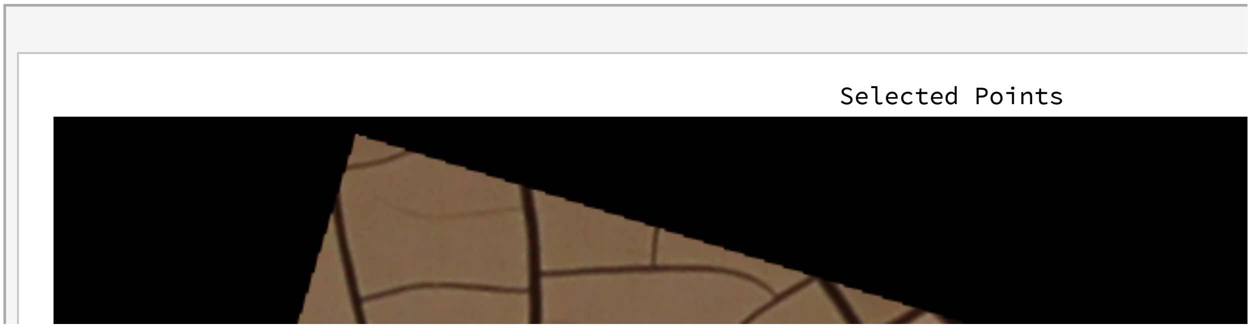


```
ImageRotate[img, -0.207694]
```

```
In[•]:= img = 
```

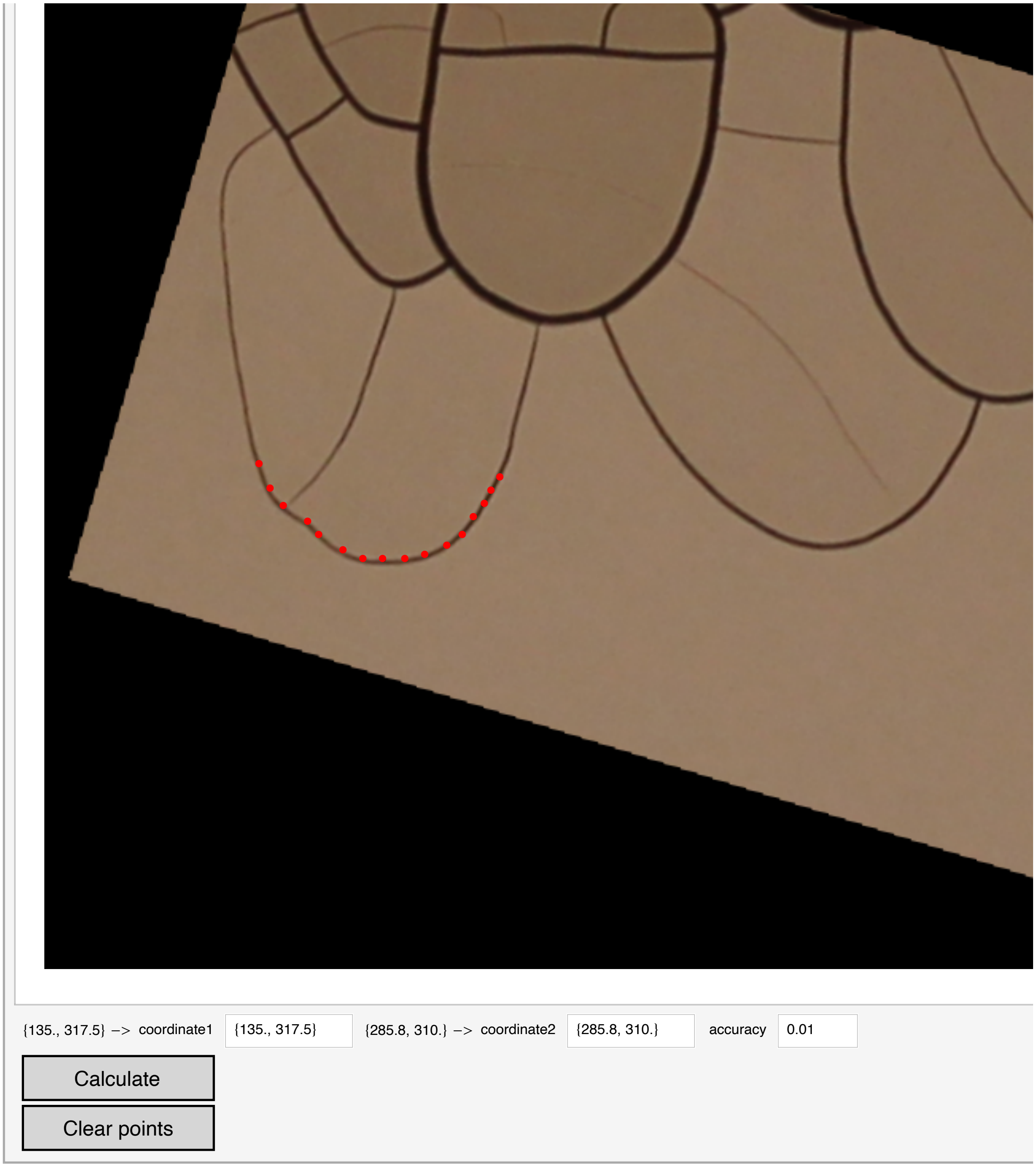


```
;

points = {};
curvatures = {};
GetList[i_, points_] := Module[{}, ClearAll[list]; list = {};
  Row[{Manipulate[Grid[{{"Selected Points", "Sample List"},
       {Show[i, Graphics[{Point[u]}], ImageSize → ImageDimensions[i]],
        Dynamic[If[(ValueQ[list] == False) || (list == {}),
          "1. move bottom-left and upper-right red points\n2.
            set each coordinate\n3. add/del points if
            necessary(alt+click/cmd+click?\n4. click Calculate
            button", list = Round[#, accuracy] & /@ list;
          Sort[RandomSample[list, UpTo[10]]] // TableForm]]}}],
     Row[{Dynamic[u[[1]]], "->", Control[
         {coordinate1, {{0, 0}}, InputField, ImageSize → 80}], Dynamic[u[[2]]],
       "->", Control[{coordinate2, {{1, 1}}, InputField, ImageSize → 80}],
       Control[{{accuracy, 0.01}, InputField, ImageSize → 50}]}, "  "], Row[{Button[
        "Calculate", {list = locator2coordinate[u, {coordinate1, coordinate2}];
         };, ImageSize → 120]}, "  "], Row[{Button["Clear points", u = Take[u, 2];
        Put[u, "locator"], ImageSize → 120]}, "  "],
     {{u, Join[{{1, 1}, ImageDimensions[i] - {1, 1}}, Sort[points]]},
      Locator, LocatorAutoCreate → True, Appearance → Style["●", Red, 8]},
     ControlPlacement → {Bottom, Bottom}]}, "  "]]

locator2coordinate[list_, sample_] :=
 Module[{a, b, c, d, mat, cnst, solve, matx, cnstx}, mat = {{a, 0}, {0, d}};
  cnst = {b, c};
  solve = Solve[mat.list[[1]] + cnst == sample[[1]] &&
     mat.list[[2]] + cnst == sample[[2]], {a, b, c, d}];
  matx = mat /. solve; cnstx = cnst /. solve;
  Partition[Flatten[(matx.# + cnstx) & /@ list], 2] // Sort]
fining = img;
GetList[fining, points]
```



Selected Points

Out[∘]=

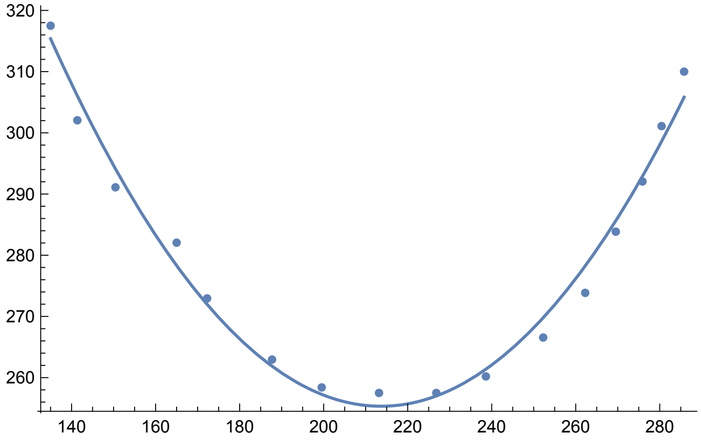


{135., 317.5} –> coordinate1 {135., 317.5} {285.8, 310.} –> coordinate2 {285.8, 310.} accuracy 0.01

```
In[•]:= list
         da2 = list;

        g1 = ListPlot[da2];
        Fit[da2, {1, x, x^2}, x];
        f = %;
        g2 = Plot[f, {x, First@First@da2, First@Last@da2}] ;
        Show[g1, g2]
        nlm = NonlinearModelFit[da2, u + v * x + w * x^2, {u, v, w}, x]
        nlm[ "RSquared" ]
        nlm[{"RSquared", "ANOVATable"}]

        cur1[f0_] := Module[ {x0, r0},
          x0 =  x /. Last[FindMinimum[f0, {x, 0}]];
          (* First@Flatten[FindMinimum[f0,{x,0}] ]  *)
          (* ArcCurvature[f0,x] *)
          (*Simplify[ArcCurvature[f0,x]/.x→x0,x0∈Reals] *)
          r0 = 1 / Simplify[ArcCurvature[f0, x] /. x → x0, x0 ∈ Reals];
          Show[Plot[f0, {x, x0 - 2 * r0, x0 + 2 * r0}],
           Graphics[{Red, Circle[{x0, First@Flatten[FindMinimum[f0, {x, 0}] ] + r0}, r0],
             Inset[Curvature Radius == r0,
              {x0, First@Flatten[FindMinimum[f0, {x, 0}] ] + 0.3 * r0}]}]]
         ]
        curv0[f0_] := Module[ {x0, r0},
          x0 =  x /. Last[FindMinimum[f0, {x, 0}]];
          r0 = 1 / Simplify[ArcCurvature[f0, x] /. x → x0, x0 ∈ Reals]
         ]
         g3 = cur1[f] ;
        Show[g1, g2, g3, AspectRatio → 0.4]
```

```
Out[•]= {{135., 317.5}, {141.36, 302.05}, {150.44, 291.1}, {165., 282.05},
         {172.26, 272.95}, {187.72, 262.95}, {199.54, 258.4}, {213.18, 257.5},
         {226.82, 257.5}, {238.62, 260.2}, {252.26, 266.55}, {262.26, 273.85},
         {269.54, 283.85}, {275.9, 292.05}, {280.44, 301.1}, {285.8, 310.}}
```

Out[•]=



Out[•]= FittedModel[$698.276 - 4.14619\,x + 0.00970256\,x^2$]

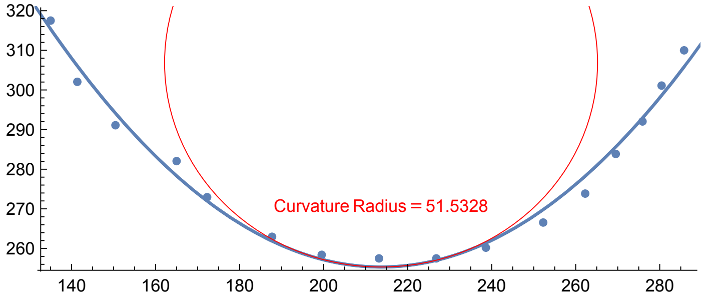
Out[•]= 0.999912

Out[•]= {0.999912,

	DF	SS	MS
Model	3	1.26562×10^6	421 874.
Error	13	110.827	8.52514
Uncorrected Total	16	1.26573×10^6	
Corrected Total	15	5949.57	

}

Out[•]=


Curvature Radius = 51.5328