Conics, Cubics, etc.

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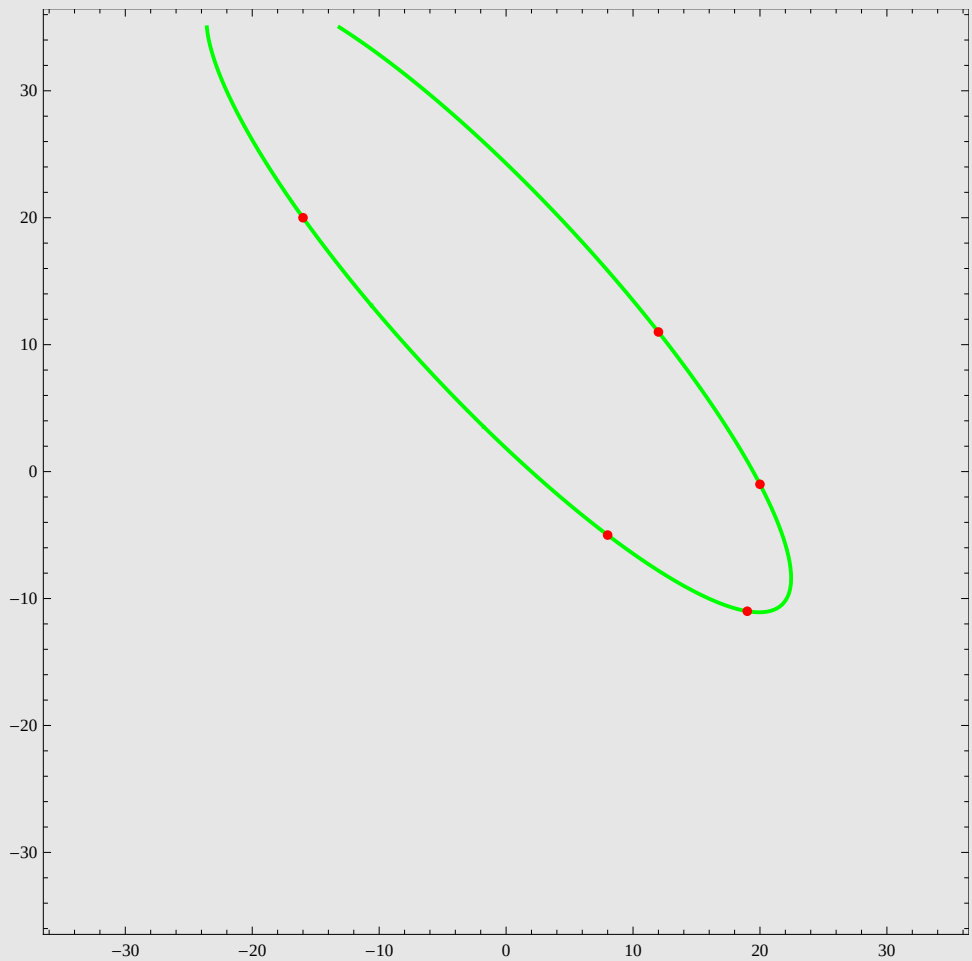
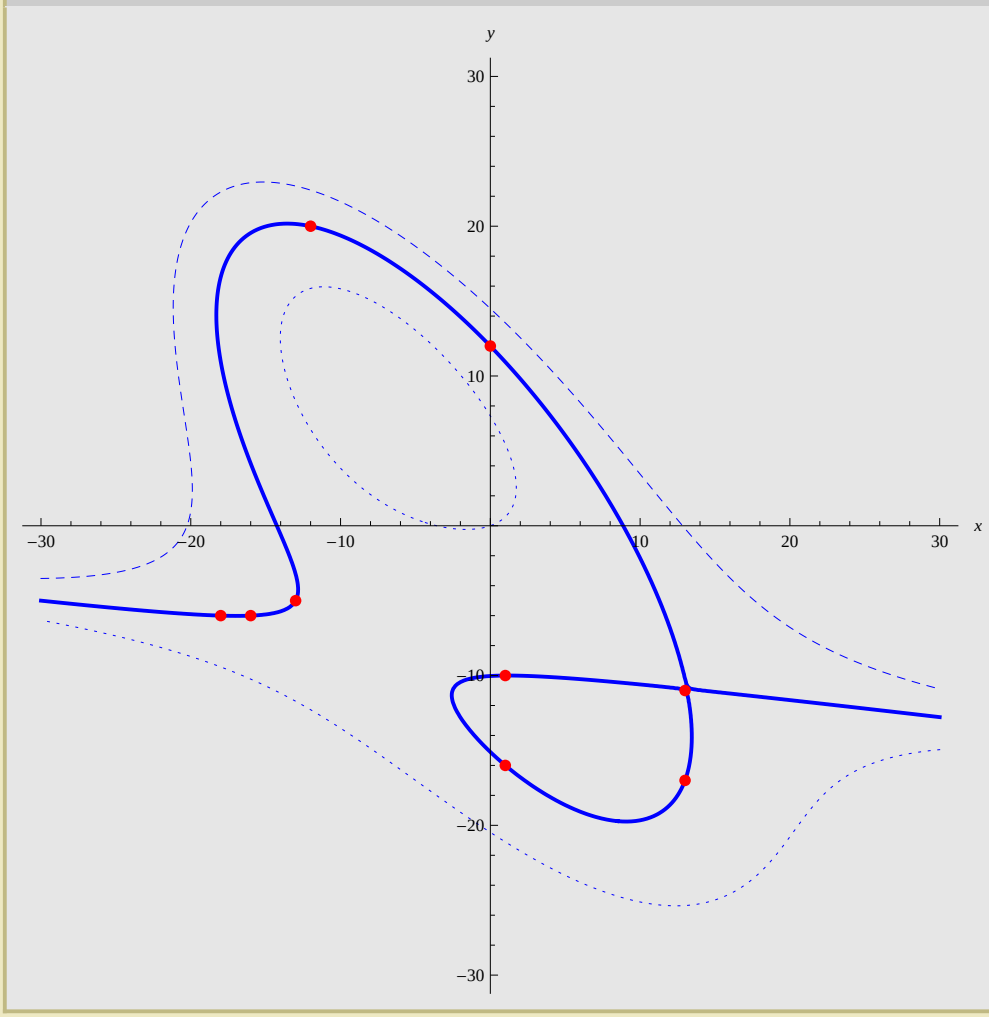
Conic through 5 points

```
pol = {x, y, x^2, x y, y^2};
pts = RandomInteger[{-20, 20}, {5, 2}]; coeff = Array[a, 5];
sols = Solve[Table[coeff.(pol /. {x → pts[[k, 1]], y → pts[[k, 2]]}) == 1, {k, 1, 5}]];
ContourPlot[(coeff /. sols).pol, {x, -35, 35}, {y, -35, 35}, Contours → {1},
 ContourStyle → {Green, Thick}, ContourShading → False, PlotPoints → 100,
 Epilog → {AbsolutePointSize[5], Red, Point[pts]}, ImageSize → 500]
```



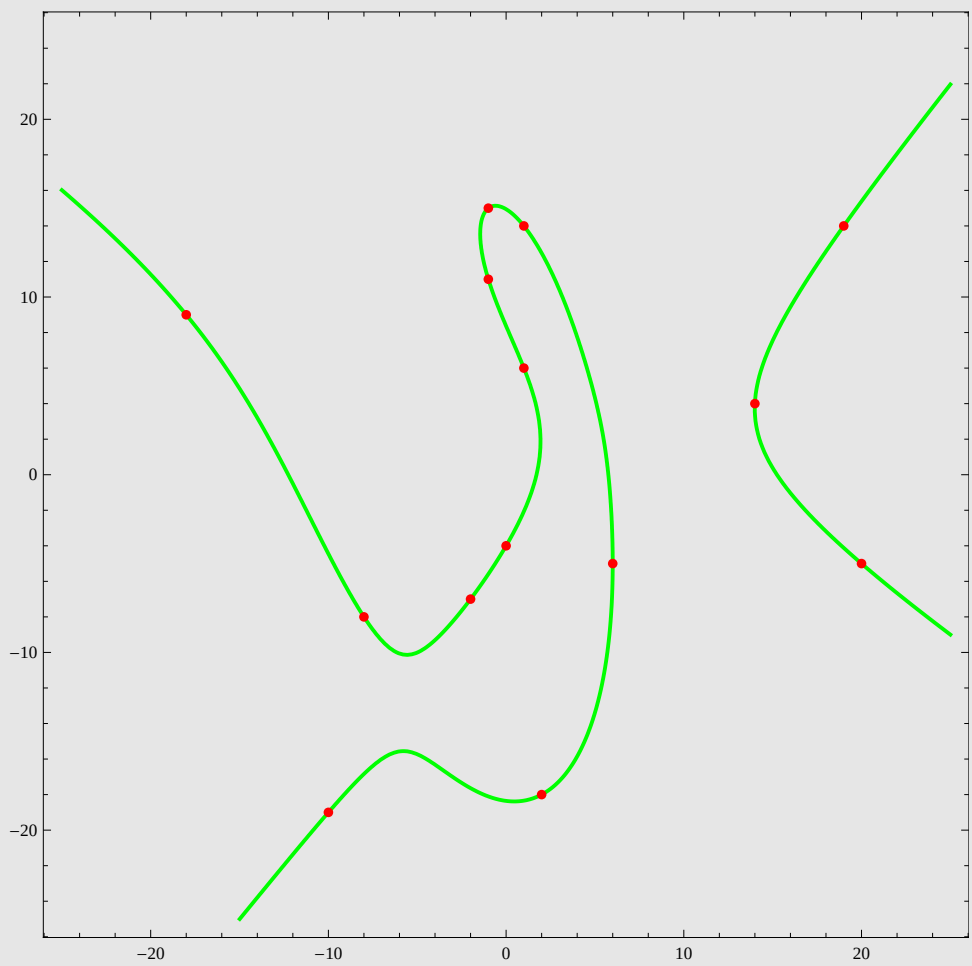
Cubic through 9 points

```
pol = {x, y, x^2, x y, y^2, x^3, x^2 y , x y^2, y^3};
pts = RandomInteger[{-20, 20}, {9, 2}]; coeff = Array[a, 9];
sols = Solve[Table[coeff.(pol /. {x → pts[[k, 1]], y → pts[[k, 2]]}) == 1, {k, 1, 9}]];
ContourPlot[(coeff /. sols).pol, {x, -30, 30}, {y, -30, 30}, Contours → {0, 1, 2},
 ContourStyle → {{Blue, Dotted}, {Blue, Thick}, {Blue, Dashed}},
 ContourShading → False, PlotPoints → 100,
 Epilog → {AbsolutePointSize[6], Red, Point[pts]},
 ImageSize → 500, Frame → None, Axes → True, AxesLabel → {x, y}]
```



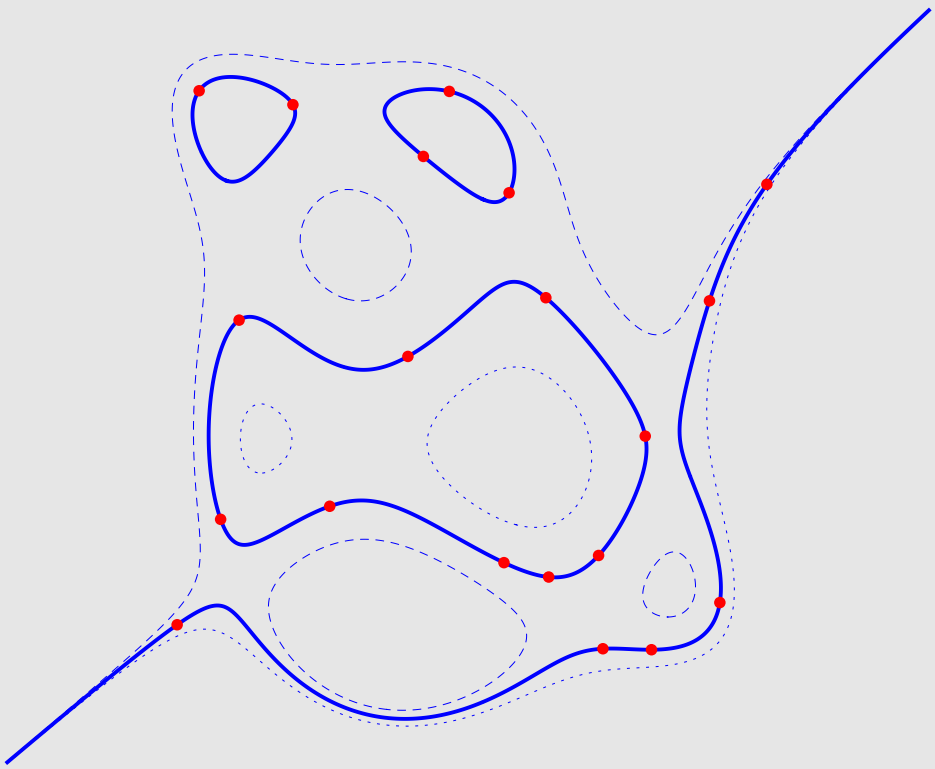
Quartic through 14 points

```
pol =
  {x, y, x^2, x y, y^2, x^3, x^2 y, x y^2, y^3, x^4, x^3 y, x^2 y^2, x y^3, y^4};
pts = RandomInteger[{-20, 20}, {14, 2}]; coeff = Array[a, 14];
sols = Solve[Table[coeff.(pol /. {x → pts[[k, 1]], y → pts[[k, 2]]}) == 1, {k, 1, 14}]];
ContourPlot[(coeff /. sols).pol, {x, -25, 25}, {y, -25, 25}, Contours → {1},
 ContourStyle → {Green, Thick}, ContourShading → False, PlotPoints → 100,
 Epilog → {AbsolutePointSize[5], Red, Point[pts]}, ImageSize → 500]
```



Quintic through 20 points

```
pol = {x, y, x^2, x y, y^2, x^3, x^2 y, x y^2, y^3, x^4, x^3 y,
   x^2 y^2, x y^3, y^4, x^5, x^4 y, x^3 y^2, x^2 y^3, x y^4, y^5};
pts = RandomReal[{-20, 20}, {20, 2}]; coeff = Array[a, 20];
sols = Solve[Table[coeff.(pol /. {x → pts[[k, 1]], y → pts[[k, 2]]}) == 1, {k, 1, 20}]];
ContourPlot[(coeff /. sols).pol, {x, -30, 30}, {y, -30, 30}, Contours → {0, 1, 2},
 ContourStyle → {{Blue, Dotted}, {Blue, Thick}, {Blue, Dashed}},
 ContourShading → False, PlotPoints → 250,
 Epilog → {AbsolutePointSize[6], Red, Point[pts]}, ImageSize → 500, Frame → None]
```



Sextic through 27 points

```
pol = {x, y, x^2, x y, y^2, x^3, x^2 y , x y^2, y^3,
   x^4, x^3 y, x^2 y^2, x y^3, y^4, x^5, x^4 y, x^3 y^2, x^2 y^3,
   x y^4, y^5, x^6, x^5 y, x^4 y^2, x^3 y^3, x^2 y^4, x y^5, y^6};
pts = RandomReal[{-20, 20}, {27, 2}]; coeff = Array[a, 27];
sols = Solve[Table[coeff.(pol /. {x → pts[[k, 1]], y → pts[[k, 2]]}) == 1, {k, 1, 27}]];
ContourPlot[(coeff /. sols).pol, {x, -30, 30}, {y, -30, 30}, Contours → {0.9, 1, 1.1},
 ContourStyle → {{Blue, Dotted}, {Blue, Thick}, {Blue, Dashed}},
 ContourShading → False, PlotPoints → 300,
 Epilog → {AbsolutePointSize[6], Red, Point[pts]}, ImageSize → 500, Frame → None]
```