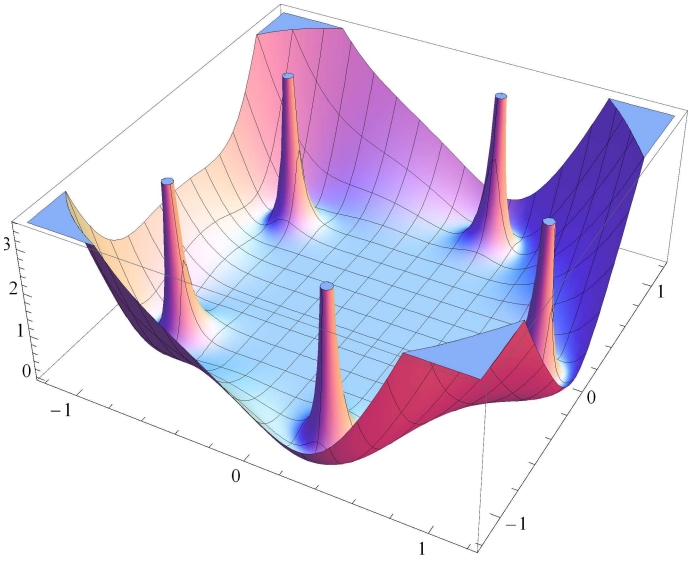
In[12]:=
```
Clear["Global`*"];
q[z_] := z^5 - 1;
```

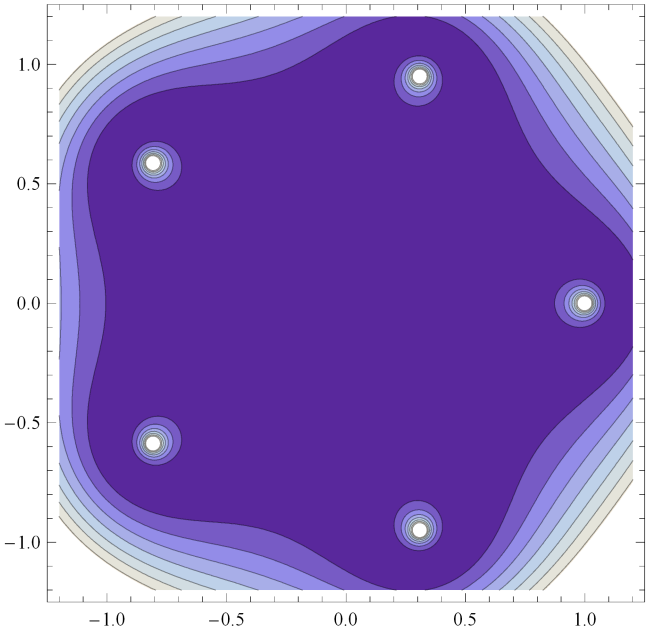
In[14]:=
```
Plot3D[(Log[Abs[q[x + I * y]]])^2, {x, -1.2, 1.2}, {y, -1.2, 1.2}, PlotPoints → 50]
```

Out[14]=



In[15]:=
```
ContourPlot[(Log[Abs[q[x + I * y]]])^2, {x, -1.2, 1.2}, {y, -1.2, 1.2}, PlotPoints → 50]
```

Out[15]=



In[16]:=
```
(* {{-0.808137,0.599683},{0.307063,0.965007},{0.999256,0.0228551},{0.316677,-0.92891},{-0.808137,-0.563586}} *)
```

In[17]:=
```
FindRoot[z^5 - 1, {z, -0.808137 + 0.599683 I}]
```

Out[17]=
```
{z → -0.809017 + 0.587785 i}
```

In[18]:=
```
z^5 - 1 /. FindRoot[z^5 - 1, {z, -0.808137 + 0.599683 I}]
```

Out[18]=
```
2.22045 × 10^-16 + 4.77049 × 10^-17 i
```

In[19]:=
```
? Series
```

Series[f, {x, x_0, n}] generates a power series expansion for f about the point $x = x_0$ to order $(x - x_0)^n$.
Series[f, {x, x_0, n_x}, {y, y_0, n_y}] successively finds series expansions with respect to x, then y. ≫

In[20]:=
```
f[z_] := Exp[z^2] / (z^2 - 6 z); z0 = 2; Series[f[z], {z, 2, 6}]
```

Out[20]=
$$-\frac{e^4}{8}-\frac{15}{32}e^4(z-2)-\frac{131}{128}e^4(z-2)^2-\frac{2513\,e^4(z-2)^3}{1536}-\frac{4331\,e^4(z-2)^4}{2048}-\frac{285\,797\,e^4(z-2)^5}{122\,880}-\frac{663\,011\,e^4(z-2)^6}{294\,912}+O[z-2]^7$$

In[21]:=
```
TaylorRatioTest[func_, z0_, lastterm_] :=
                Module[{z, i, k, n, g, h, lt},
  lt = lastterm;
  g[0] = func[z];
  g[n_] := g[n] = D[g[n - 1], z];
  k = 0;
  h[n_] := h[n] = Module[{a},
                   For[k++; a = (g[k] / k!) /. z → z0,
                   a == 0,
                   k = k + 1,
                   a = (g[k] / k!) /. z → z0];
                   Return[a];
                  ];
  Table[Abs[N[h[i] / h[i + 1]]], {i, 1, lt}]
 ];
```

In[22]:=
```
TaylorRatioTest[f, 2, 60]
```

Out[22]=
```
{0.458015, 0.625547, 0.773647, 0.909247, 1.03454, 1.1519, 1.26248, 1.36744, 1.46746, 1.56321, 1.65512, 1.74362, 1.82901, 1.91159, 1.99156,
 2.06914, 2.14447, 2.21773, 2.28901, 2.35846, 2.42611, 2.49213, 2.55649, 2.61937, 2.68069, 2.74066, 2.79909, 2.85635, 2.91196, 2.96669,
 3.01946, 3.07193, 3.12154, 3.17234, 3.21786, 3.26858, 3.30724, 3.36258, 3.38602, 3.46062, 3.44271, 3.58408, 3.44031, 3.81026, 3.26372,
 4.46772, 2.62012, 8.02313, 1.18387, 13.1684, 0.505689, 3.29435, 1.49437, 2.30274, 1.85471, 2.07776, 1.96088, 2.0202, 1.98976, 2.00522}
```