In[91]:=
```
σ = 10;
b = 8 / 3;
r = 28;
f[x_, y_, z_] = σ (y - x);
g[x_, y_, z_] = r * x - y - x * z;
h[x_, y_, z_] = x * y - b * z;
sol = Solve[f[x, y, z] == 0 && g[x, y, z] == 0 && h[x, y, z] == 0, {x, y, z}]
J[x_, y_, z_] := {{D[f[x, y, z], x], D[f[x, y, z], y], D[f[x, y, z], z]},
   {D[g[x, y, z], x], D[g[x, y, z], y], D[g[x, y, z], z]},
   {D[h[x, y, z], x], D[h[x, y, z], x], D[h[x, y, z], z]}};
Eigenvalues[J[x, y, z] /. sol[[1]]]
Eigenvalues[J[x, y, z] /. sol[[2]]]
Eigenvalues[J[x, y, z] /. sol[[3]]]
```

Out[97]= $\left\{\{x \to 0, y \to 0, z \to 0\}, \left\{x \to -6\sqrt{2}, y \to -6\sqrt{2}, z \to 27\right\}, \left\{x \to 6\sqrt{2}, y \to 6\sqrt{2}, z \to 27\right\}\right\}$

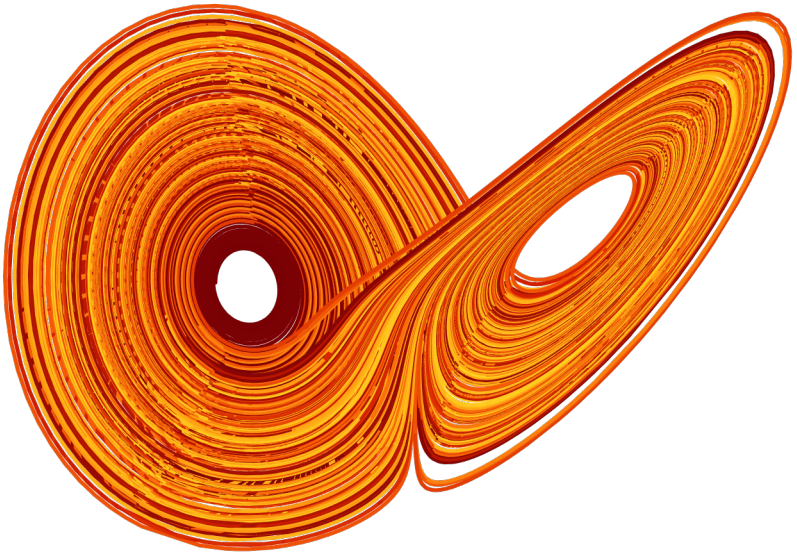
Out[99]= $\left\{\frac{1}{2} \times \left(-11 - \sqrt{1201}\right), \frac{1}{2} \times \left(-11 + \sqrt{1201}\right), -\frac{8}{3}\right\}$

Out[100]= $\left\{\frac{1}{3}\ \text{Root}[\ldots, 1], \frac{1}{3}\ \text{Root}[\ldots, 2], \frac{1}{3}\ \text{Root}[\ldots, 3]\right\}$

Out[101]= $\left\{\frac{1}{3}\ \text{Root}[\ldots, 1], \frac{1}{3}\ \text{Root}[\ldots, 2], \frac{1}{3}\ \text{Root}[\ldots, 3]\right\}$

In[106]:=
```
sol = NDSolve[{x'[t] == σ * (y[t] - x[t]), y'[t] == r * x[t] - y[t] - x[t] * z[t],
    z'[t] == x[t] * y[t] - b * z[t], x[0] == y[0] == z[0] == 0.01},
   {x, y, z}, {t, 0, 400}, MaxSteps → 1000000];
Show[ParametricPlot3D[Evaluate[{x[t], y[t], z[t]} /. s], {t, 5, 400},
  PlotPoints → 1000, PlotStyle → Directive[Thick, RGBColor[.8, 0, 0]],
  ColorFunction → (ColorData["SolarColors", #4] &)],
 Graphics3D[{ColorData["SolarColors"][0],
   Sphere[First[({x[t], y[t], z[t]} /. s) /. t → 0], .75]}], RotationAction → "Clip",
 Boxed → False, SphericalRegion → False, Axes → False, ImageSize → 500]
```

Out[107]=



In[145]:=
```
Clear["Global`*"]
f[x_, y_, z_] = σ (y - x);
g[x_, y_, z_] = r * x - y - x * z;
h[x_, y_, z_] = x * y - b * z;
sol = Solve[f[x, y, z] == 0 && g[x, y, z] == 0 && h[x, y, z] == 0, {x, y, z}]
J[x_, y_, z_] := {{D[f[x, y, z], x], D[f[x, y, z], y], D[f[x, y, z], z]},
  {D[g[x, y, z], x], D[g[x, y, z], y], D[g[x, y, z], z]},
  {D[h[x, y, z], x], D[h[x, y, z], x], D[h[x, y, z], z]}}
J[x, y, z] // MatrixForm
Tr[J[x, y, z]]
```

Out[149]=
$$\left\{\{x \to 0, y \to 0, z \to 0\}, \left\{x \to -\sqrt{b}\ \sqrt{-1+r}, y \to -\sqrt{b}\ \sqrt{-1+r}, z \to -1+r\right\}, \left\{x \to \sqrt{b}\ \sqrt{-1+r}, y \to \sqrt{b}\ \sqrt{-1+r}, z \to -1+r\right\}\right\}$$

Out[151]//MatrixForm=
$$\begin{pmatrix} -\sigma & \sigma & 0 \\ r-z & -1 & -x \\ y & y & -b \end{pmatrix}$$

Out[152]=
$$-1-b-\sigma$$