```
(*This is for the subcase2 f2 +/ σ = -1 *)
α = 0.05; β = 0.01; γ = 0.05; ϵ = 0.01; ξ = 0.01; θ = 1.0; ψ = -0.1;
```

In[•]:=
```
FindRoot[{α x - β y - γ z + ψ x^2, -α x + β y + γ z + θ y^2 - ϵ x Abs[z], ξ - α x + β y + γ z},
 {x, 100}, {y, 100}, {z, 100}]
```

Out[•]=
```
{x → 0.316228, y → 0.101505, z → 0.0959267}
```

In[•]:=
```
FindRoot[{α x - β y - γ z + ψ x^2, -α x + β y + γ z + θ y^2 - ϵ x Abs[z], ξ - α x + β y + γ z},
 {x, -1}, {y, 100}, {z, 100}]
```

Out[•]=
```
{x → -0.316228, y → 0.0911586, z → -0.534459}
```

In[•]:=
```
f2[y_] = θ y^2 - (ϵ β)/γ Sqrt[ξ/Abs[ψ]] y - ξ + (α ϵ ξ)/(γ Abs[ψ]) - (ϵ ξ)/γ Sqrt[ξ/Abs[ψ]]
```

Out[•]=
```
-0.00963246 - 0.000632456 y + 1. y^2
```

```
Δ = (ϵ^2 β^2 ξ)/(γ^2 Abs[ψ]) - 4 θ (-ξ + (α ϵ ξ)/(γ Abs[ψ]) - (ϵ ξ)/γ Sqrt[ξ/Abs[ψ]])
```

Out[•]=
```
0.0465302
```

In[•]:=
```
y1 = ((ϵ β)/γ Sqrt[ξ/Abs[ψ]] + Sqrt[Δ]) / (2 θ)
```

Out[•]=
```
0.0984618
```

In[•]:=
```
y2 = ((ϵ β)/γ Sqrt[ξ/Abs[ψ]] - Sqrt[Δ]) / (2 θ)
```

Out[•]=
```
-0.0978294
```

In[•]:=
```
z1 = α/γ Sqrt[ξ/Abs[ψ]] - β/γ y1 - ξ/γ
```

Out[•]=
```
0.0965354
```

In[•]:= $z2 = \frac{\alpha}{\gamma}\sqrt{\frac{\xi}{\text{Abs}[\psi]}} - \frac{\beta}{\gamma}\,y2 - \frac{\xi}{\gamma}$

Out[•]=

0.135794

In[•]:= $x1 = \sqrt{\xi / \text{Abs}[\psi]}$

Out[•]=

0.316228

In[•]:= $x2 = -\sqrt{\xi / \text{Abs}[\psi]}$

Out[•]=

−0.316228

(*This is for subcase2 f3: -/ σ = +1*)

In[•]:= Clear[α, β, γ, ϵ, ξ, θ, ψ, x, y, z]

FindRoot: 在 {x, y, z} = {−1., 100., 100.} 处，函数值
{−1. α − 100. β − 100. γ + 1. ψ, 1. α + 100. β + 100. γ + 100. ϵ + 10000. θ, 1. α + 100. β + 100. γ + ζ}
不是由数字组成的维度为 {3} 的列表.

In[•]:= α = 0.05; β = 0.01; γ = 0.05; ϵ = 0.01; ξ = 0.01; θ = 1.0; ψ = -0.1;

In[•]:= FindRoot[{α x − β y − γ z + ψ x², −α x + β y + γ z + θ y² − ϵ x Abs[z], ξ − α x + β y + γ z}, {x, 100}, {y, 100}, {z, 100}]

Out[•]=

{x → 0.316228, y → 0.101505, z → 0.0959267}

In[•]:= FindRoot[{α x − β y − γ z + ψ x², −α x + β y + γ z + θ y² − ϵ x Abs[z], ξ − α x + β y + γ z}, {x, -1}, {y, 100}, {z, 100}]

Out[•]=

{x → −0.316228, y → 0.0911586, z → −0.534459}

In[•]:= $f3 = \theta\,y^2 - \frac{\epsilon\,\beta}{\gamma}\sqrt{\frac{\xi}{\text{Abs}[\psi]}}\,y - \xi - \frac{\alpha\,\epsilon\,\xi}{\gamma\,\text{Abs}[\psi]} - \frac{\epsilon\,\xi}{\gamma}\sqrt{\frac{\xi}{\text{Abs}[\psi]}}$

Out[•]=

$-0.0116325 - 0.000632456\,y + 1.\,y^2$

In[•]:=
$$\Delta = \frac{\epsilon^2 \beta^2 \xi}{\gamma^2 \text{Abs}[\psi]} - 4\theta\left(-\xi - \frac{\alpha \epsilon \xi}{\gamma \text{Abs}[\psi]} - \frac{\epsilon \xi}{\gamma}\sqrt{\frac{\xi}{\text{Abs}[\psi]}}\right)$$

Out[•]=
0.0465302

In[•]:=
$$y1 = \left(\frac{\epsilon \beta}{\gamma}\sqrt{\frac{\xi}{\text{Abs}[\psi]}} + \sqrt{\Delta}\right) \Big/ (2\theta)$$

Out[•]=
0.108171

In[•]:=
$$y2 = \left(\frac{\epsilon \beta}{\gamma}\sqrt{\frac{\xi}{\text{Abs}[\psi]}} - \sqrt{\Delta}\right) \Big/ (2\theta)$$

Out[•]=
−0.107538

In[•]:=
$$z1 = -\frac{\alpha}{\gamma}\sqrt{\frac{\xi}{\text{Abs}[\psi]}} - \frac{\beta}{\gamma} y1 - \frac{\xi}{\gamma}$$

Out[•]=
−0.537862

In[•]:=
$$z2 = -\frac{\alpha}{\gamma}\sqrt{\frac{\xi}{\text{Abs}[\psi]}} - \frac{\beta}{\gamma} y2 - \frac{\xi}{\gamma}$$

Out[•]=
−0.49472

In[•]:=
$$x1 = \sqrt{\xi / \text{Abs}[\psi]}$$

Out[•]=
0.316228

In[•]:=
$$x2 = -\sqrt{\xi / \text{Abs}[\psi]}$$

Out[•]=
−0.316228

FindRoot: "在 {x, y, z} = {−1., 100., 100.} 处，函数值 {−1. \\\ α − 100. \\\ β − 100. \\\ γ + 1. \\\ ψ, 1. \\\ α + 100. \\\ β + 100. \\\ γ + 100. \\\ ϵ + 10000. \\\ θ, 1. \\\ α + 100. \\\ β + 100. \\\ γ + ζ} 不是由数字组成的维度为 {3} 的列表."

FindRoot: 在 {x, y, z} = {−1., 100., 100.} 处，函数值
{−1. α − 100. β − 100. γ + 1. ψ, 1. α + 100. β + 100. γ + 100. ϵ + 10000. θ, 1. α + 100. β + 100. γ + ζ}
不是由数字组成的维度为 {3} 的列表.

```
In[•]:= (*This is for the situation f4: -/-1*)
        Clear[α, β, γ, ϵ, ξ, Θ, ψ, x, y, z]

In[•]:= α = 0.05; β = 0.01; γ = 0.05; ϵ = 0.01; ξ = 0.01; Θ = 1.0; ψ = -0.1;

In[•]:= FindRoot[{α x - β y - γ z + ψ x^2, -α x + β y + γ z + Θ y^2 - ϵ x Abs[z], ξ - α x + β y + γ z},
          {x, 100}, {y, 100}, {z, 100}]

Out[•]=
        {x → 0.316228, y → 0.101505, z → 0.0959267}

In[•]:= f4[y_] = Θ y^2 + (ϵ β)/γ Sqrt[ξ/Abs[ψ]] y - ξ + (α ϵ ξ)/(γ Abs[ψ]) + (ϵ ξ)/γ Sqrt[ξ/Abs[ψ]]

Out[•]=
        -0.00836754 + 0.000632456 y + 1. y^2

In[•]:= Δ = (ϵ^2 β^2 ξ)/(γ^2 Abs[ψ]) - 4 Θ (-ξ + (α ϵ ξ)/(γ Abs[ψ]) + (ϵ ξ)/γ Sqrt[ξ/Abs[ψ]])

Out[•]=
        0.0334706

In[•]:= y1 = (-(ϵ β)/γ Sqrt[ξ/Abs[ψ]] + Sqrt[Δ]) / (2 Θ)

Out[•]=
        0.0911586

In[•]:= y2 = (-(ϵ β)/γ Sqrt[ξ/Abs[ψ]] - Sqrt[Δ]) / (2 Θ)

Out[•]=
        -0.0917911

In[•]:= z1 = -α/γ Sqrt[ξ/Abs[ψ]] - β/γ y1 - ξ/γ

Out[•]=
        -0.534459

In[•]:= z2 = -α/γ Sqrt[ξ/Abs[ψ]] - β/γ y2 - ξ/γ

Out[•]=
        -0.49787
```

In[•]:=
```
x1 = - √(ξ / Abs[ψ])
```

Out[•]=
```
-0.316228
```

In[•]:=

```
FindRoot[{x^3 y + 2 x^2 + 9 x y, 4 y^4 - 5 x y^3 + 9 x y}, {x, 1}, {y, 4}]
```

Out[•]=
$$\{x \to 1.68081 \times 10^{-39},\ y \to 2.7359 \times 10^{-8}\}$$

In[•]:=
```
xyrule = FindRoot[{x^3 y + 2 x^2 + 9 x y, 4 y^4 - 5 x y^3 + 9 x y}, {x, 1}, {y, 1}]
```

Out[•]=
$$\{x \to 6.1704 \times 10^{-9},\ y \to 1.68942 \times 10^{-9}\}$$

In[•]:=
```
{x^3 y + 2 x^2 + 9 x y, 4 y^4 - 5 x y^3 + 9 x y} /. xyrule
```

Out[•]=
$$\{1.69967 \times 10^{-16},\ 9.38196 \times 10^{-17}\}$$

In[•]:=
```
For[i = -5, i < 5, i++;
 xyrule = FindRoot[{x^3 * y + 4 * y^2 - 3 x y, x y^4 - 8 y^3 + 7 x^2 y - 8}, {x, 3}, {y, i}];
 rasiduals = {x^3 y + 2 x^2 + 9 x y, 4 y^4 - 5 x y^3 + 9 x y} /. xyrule;
 Print[xyrule, "", rasiduals, "x = 3", "," , "y= ", i]
]
```

{x → 2.47105, y → -1.91881}{-59.4126, 98.8359}x = 3,y= -4

{x → 2.47105, y → -1.91881}{-59.4126, 98.8359}x = 3,y= -3

{x → 2.47105, y → -1.91881}{-59.4126, 98.8359}x = 3,y= -2

FindRoot: 线搜索把步长降低到由 AccuracyGoal 和 PrecisionGoal 指定的容差范围内，但是无法使优化目标函数的值减小得足够多. 您可能需要多于 MachinePrecision 位的工作精度以满足这些容差.

{x → 1.57828, y → 0.4375}{12.9164, 5.70018}x = 3,y= -1

FindRoot: 在点 {x, y} = {3., 0.} 碰到奇异雅克比. 尝试扰动初始点.

{x → 3., y → 0.}{18., 0.}x = 3,y= 0

{x → -1.91648, y → 0.322392}{-0.484268, -5.19642}x = 3,y= 1

FindRoot: 线搜索把步长降低到由 AccuracyGoal 和 PrecisionGoal
指定的容差范围内，但是无法使优化目标函数的值减小得足够多. 您可能需要多于 MachinePrecision
位的工作精度以满足这些容差.

{x → 1.54823, y → 0.427009}{12.3287, 5.48024}x = 3,y= 2

FindRoot: 线搜索把步长降低到由 AccuracyGoal 和 PrecisionGoal
指定的容差范围内，但是无法使优化目标函数的值减小得足够多. 您可能需要多于 MachinePrecision
位的工作精度以满足这些容差.

General: 在本次计算中，FindRoot::lstol 的进一步输出将被抑制.

{x → 1.53175, y → 0.421292}{12.0145, 5.36117}x = 3,y= 3

{x → 1.53126, y → 0.421123}{12.0052, 5.35764}x = 3,y= 4

{x → 1.55886, y → 0.430713}{12.5345, 5.55768}x = 3,y= 5

In[ ]:=
```
xyrule = FindRoot[{x^3 y + 2 x^2 + 9 x y, 4 y^4 - 5 x y^3 + 9 x y}, {x, 3}, {y, -4}]
```

Out[ ]=

$$\{x \to 2.74443 \times 10^{-39},\ y \to -2.7002 \times 10^{-8}\}$$

```
(*April 2, this week we choose a general case and through change the
 staring point to watch the changes. Also we can see the equilibria,
and try to restore the same diagram from the research paper*)

(*case 1b*)
```

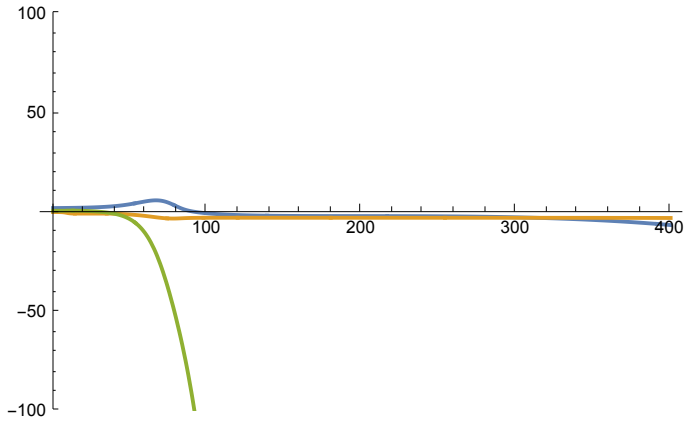
In[ ]:=
```
α = 0.05;
β = 0.01;
γ = 0.05;
δ = 0.02;
ϵ = 0.03;
ζ = 0.1;
η = 0.04;
Θ = 1.0;
ψ = -0.01;
```

In[•]:=
```
s = NDSolve[{x'[t] == α x[t] + β y[t] - γ z[t] + ψ x[t]^2 - δ z[t] × y[t],
    y'[t] == β y[t] - α x[t] + γ z[t] + Θ y[t]^2 - ϵ Abs[z[t]] × x[t],
    z'[t] == ζ + γ z[t] - α x[t] + β y[t] - η x[t] × Abs[y[t]],
    x[0] == 2.3753, y[0] == 0.3699, z[0] == 1.0218}, {x, y, z}, {t, 180}]
```

Out[•]=
```
{{x → InterpolatingFunction[ <image> Domain: {{0., 180.}}
                             Output: scalar ],
  y → InterpolatingFunction[ <image> Domain: {{0., 180.}}
                             Output: scalar ],
  z → InterpolatingFunction[ <image> Domain: {{0., 180.}}
                             Output: scalar ]}}
```

In[•]:=
```
Plot[Evaluate[{x[t], y[t], z[t]} /. s], {t, 0, 400}, PlotRange → {100, -100}]
```

Out[•]=



In[•]:=
```
Evaluate[{x[t], y[t], z[t]} /. s] /. t → 400
```

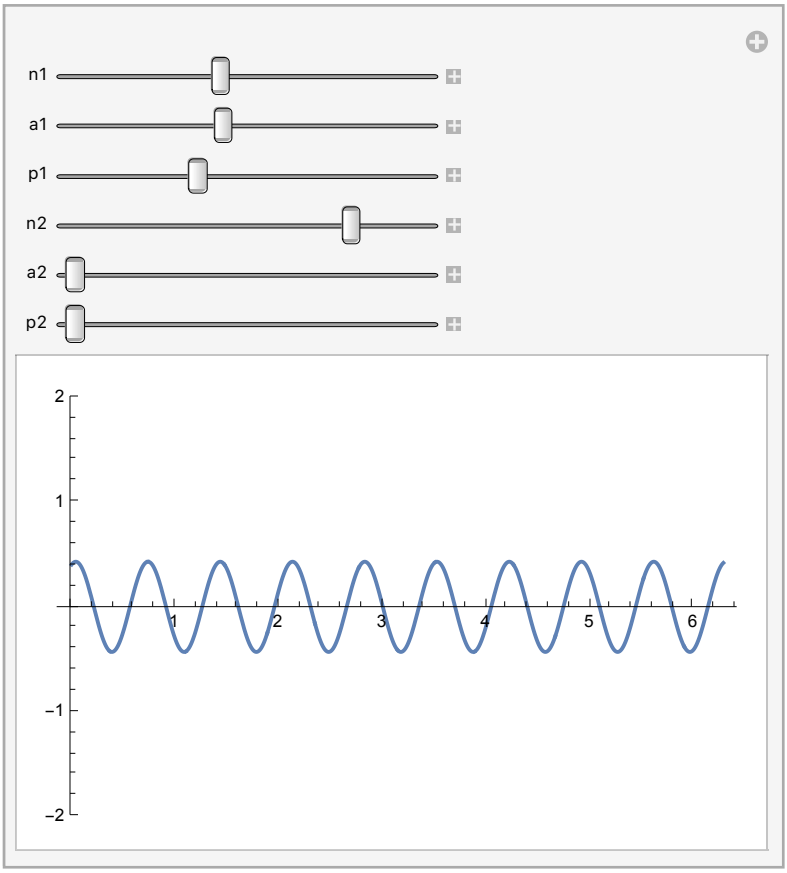
Out[•]=
```
{{-1.66667, -2.5, -4.80485 × 10^8}}
```

In[•]:=
```
Evaluate[{x[t], y[t], z[t]} /. s] /. t → 150
```

Out[•]=
```
{{-1.55006, -2.49664, -1796.92}}
```

In[ ]:=
```
Manipulate[Plot[a1 Sin[n1 (x + p1)] + a2 Sin[n2 (x + p2)], {x, 0, 2 Pi}, PlotRange → 2],
 {n1, 1, 20}, {a1, 0, 1}, {p1, 0, 2 Pi}, {n2, 1, 20}, {a2, 0, 1}, {p2, 0, 2 Pi}]
```

Out[ ]=



In[ ]:=
```
(*New try*)
ClearAll
```

Out[ ]=
```
ClearAll
```

In[ ]:=
```
α = 0.05;
β = 0.01;
γ = 0.05;
δ = 0.02;
ϵ = 0.03;
ζ = 0.1;
η = 0.04;
Θ = 1.0;
ψ = -0.01;
```

In[•]:=
```
s = NDSolve[{x'[t] == α x[t] + β y[t] - γ z[t] + ψ x[t]^2 - δ z[t] × y[t],
    y'[t] == β y[t] - α x[t] + γ z[t] + Θ y[t]^2 - ϵ Abs[z[t]] × x[t],
    z'[t] == ξ + γ z[t] - α x[t] + β y[t] - η x[t] × Abs[y[t]],
    x[0] == 2.3753, y[0] == 0.3699, z[0] == 1.0218}, {x, y, z}, {t, 180}]
```

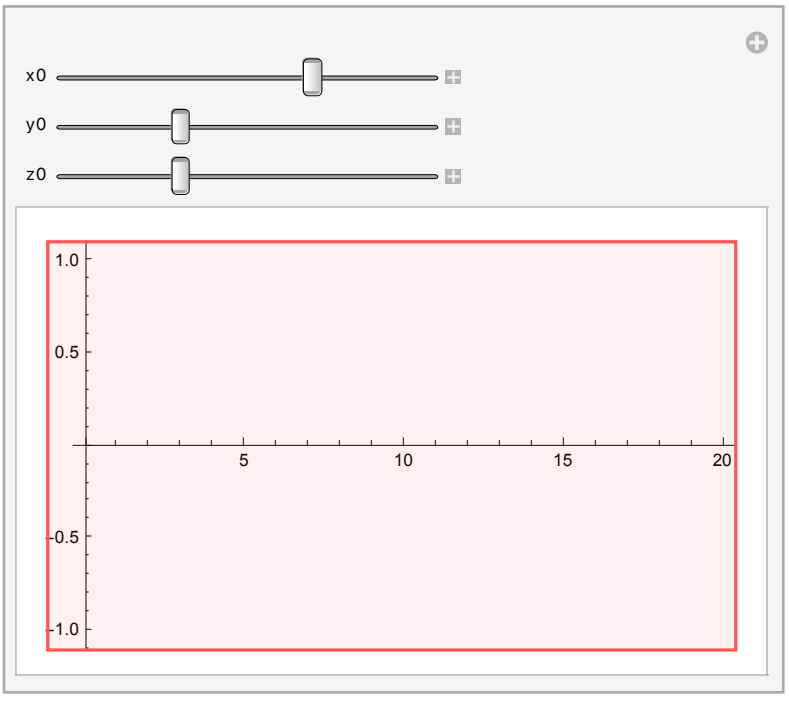
Out[•]=
```
{{x → InterpolatingFunction[ Domain: {{0., 180.}}
                             Output: scalar ],

  y → InterpolatingFunction[ Domain: {{0., 180.}}
                             Output: scalar ],

  z → InterpolatingFunction[ Domain: {{0., 180.}}
                             Output: scalar ]}}
```

In[•]:=
```
Manipulate[Plot [Evaluate[ {x[t], y[t], z[t]} /.
     NDSolve[{x'[t] == α x[t] + β y[t] - γ z[t] + ψ x[t]^2 - δ z[t] × y[t],
       y'[t] == β y[t] - α x[t] + γ z[t] + Θ y[t]^2 - ϵ Abs[z[t]] × x[t],
       z'[t] == ξ + γ z[t] - α x[t] + β y[t] - η x[t] × Abs[y[t]],
       x[0] == x0, y[0] == y0, z[0] == z0}, {x, y, z}, {t, 500} ]],
  {t, 0, 20}], {x0, 1.5, 2.5}, {y0, 0.1, 0.4}, {z0, 0.5, 1}]
```

Out[•]=



NDSolve: 在 t == 43.07390043755897` 处，步长实际上为零；可能存在奇点或者刚性系统.

NDSolve: 在 t == 428.2778915751553` 处误差测试失败；无法继续.

NDSolve: 在 t == 475.9963471704903` 处误差测试失败；无法继续.

NDSolve: 在 t == 490.36442365902656` 处误差测试失败；无法继续.

NDSolve: 在 t == 494.5508003645437` 处误差测试失败；无法继续.

NDSolve: 在 t == 451.03839494726344` 处误差测试失败；无法继续.

NDSolve: 在 t == 462.36984853918614` 处误差测试失败；无法继续.

NDSolve: 在 t == 462.36984853918614` 处误差测试失败；无法继续.

NDSolve: 在 t == 42.051140676190315` 处，步长实际上为零；可能存在奇点或者刚性系统.

NDSolve: 在 t == 42.051140676190315` 处，步长实际上为零；可能存在奇点或者刚性系统.

NDSolve: 在 t == 42.051140676190315` 处，步长实际上为零；可能存在奇点或者刚性系统.

NDSolve: 在 t == 3.7371551234778977` 处，步长实际上为零；可能存在奇点或者刚性系统.

NDSolve: 在 t == 473.4893765211817` 处误差测试失败；无法继续.

NDSolve::ndnum: 在 t == 0. 处碰到一个导数的非数值量.

ReplaceAll::reps:
{NDSolve[{x'[t] == α x[t] + ψ x[t]^2 + β y[t] − γ z[t] − δ y[t] z[t],
y'[t] == −(α x[t]) − ϵ Abs[z[t]] x[t] + β y[t] + θ y[t]^2 + γ z[t],
<<3>>, z[0] == 0.654}, {x, y, z}, {t, 500}]}
既不是替换规则列表，也不是一个有效的分派表，因此无法用来替换.

NDSolve::dsvar: 0.000408571 不能用作变量.

ReplaceAll::reps:
{NDSolve[{x'[0.000408571] ==
α x[0.000408571] + ψ x[0.000408571]^2 + β y[0.000408571] −
γ z[0.000408571] − δ y[0.000408571] z[0.000408571], <<4>>,
z[0] == 0.654}, {x, <<2>>}, {<<10>>1, 500}]}
既不是替换规则列表，也不是一个有效的分派表，因此无法用来替换.

NDSolve::dsvar: 0.000408571 不能用作变量.

ReplaceAll::reps:
{NDSolve[{x'[0.000408571] ==
α x[0.000408571] + ψ x[0.000408571]^2 + β y[0.000408571] −
1. γ z[0.000408571] − 1. δ y[0.000408571] z[0.000408571], <<4>>,
z[0.] == 0.654}, {x, <<2>>}, {<<2>>}]} 既不是替换规则列表，也不是一个有效的分派表，因此无法用来替换.

General::stop: 在本次计算中，ReplaceAll::reps 的进一步输出将被抑制.

NDSolve::dsvar: 0.408572 不能用作变量.

General::stop: 在本次计算中，NDSolve::dsvar 的进一步输出将被抑制.

In[ ]:=
```
(*This is for April 16th, try to change the diffierent value to detect
 the changes in the plot and look the different to see what happened*)
```

In[ ]:=
```
ClearAll
```

Out[ ]=
```
ClearAll
```

```
(* This is case 1c*)
```

In[•]:=
```
α = 0.05;
β = 0.01;
γ = 0.05;
δ = 0.02;
ϵ = 0.01;
ξ = 0.1;
η = 0.05;
Θ = 1.0;
ψ = -0.01;
```

In[•]:=
```
s = NDSolve[{x'[t] == α x[t] - β y[t] - γ z[t] + ψ x[t]^2 - δ z[t] × y[t],
   y'[t] == β y[t] - α x[t] + γ z[t] + Θ y[t]^2 - ϵ Abs[z[t]] × x[t],
   z'[t] == ξ + γ z[t] - α x[t] + β y[t] - η x[t] × Abs[y[t]],
   x[0] == 2.2821, y[0] == 0.2843, z[0] == 1.0082}, {x, y, z}, {t, 400}]
```

NDSolve: 在 t == 79.8975520898404` 处，步长实际上为零；可能存在奇点或者刚性系统.

Out[•]=

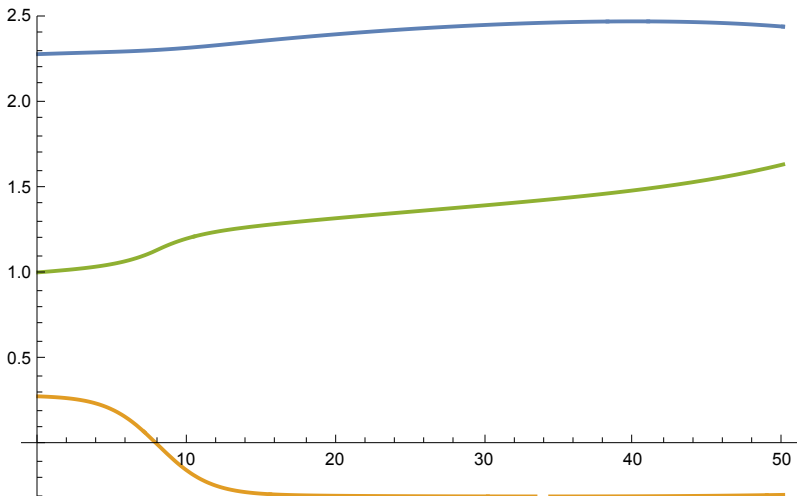
$$\left\{\left\{x \to \text{InterpolatingFunction}\left[\text{Domain: } \{\{0., 79.9\}\} \text{ Output: scalar}\right],\right.\right.$$

$$y \to \text{InterpolatingFunction}\left[\text{Domain: } \{\{0., 79.9\}\} \text{ Output: scalar}\right],$$

$$\left.\left.z \to \text{InterpolatingFunction}\left[\text{Domain: } \{\{0., 79.9\}\} \text{ Output: scalar}\right]\right\}\right\}$$

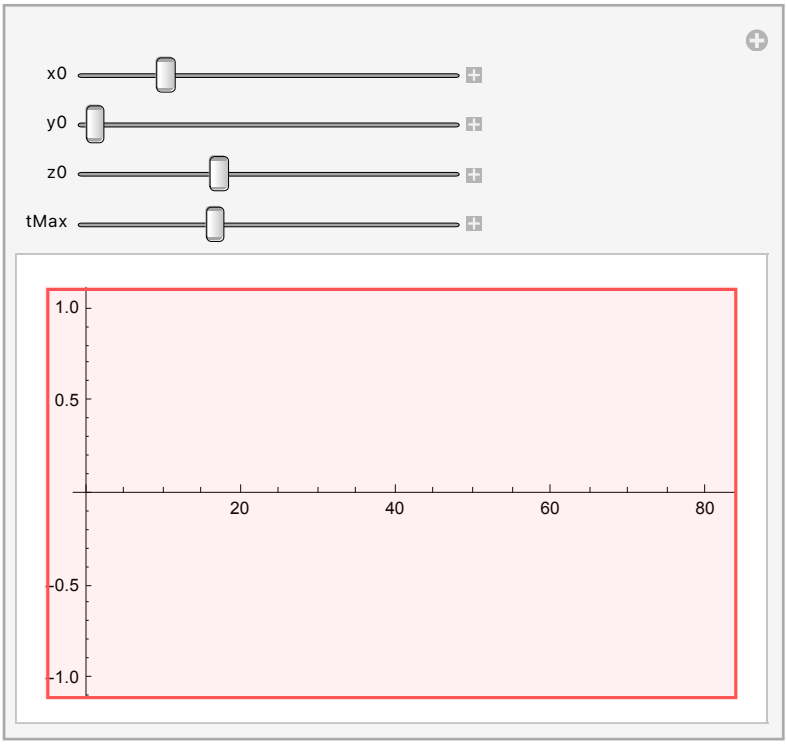
In[•]:=
```
Plot[Evaluate[{x[t], y[t], z[t]} /. s], {t, 0, 50}, PlotRange → {-0.3, 2.5}]
```

Out[•]=



In[ ]:=
```
Manipulate[Plot [Evaluate[ {x[t], y[t], z[t]} /.
      NDSolve[{x'[t] == α x[t] - β y[t] - γ z[t] + ψ x[t]^2 - δ z[t] × y[t],
        y'[t] == β y[t] - α x[t] + γ z[t] + Θ y[t]^2 - ϵ Abs[z[t]] × x[t],
        z'[t] == ξ + γ z[t] - α x[t] + β y[t] - η x[t] × Abs[y[t]],
        x[0] == x0, y[0] == y0, z[0] == z0}, {x, y, z}, {t, 500} ]], {t, 0, tMax}],
  {x0, 2.2, 3}, {y0, 0.4, 1.0}, {z0, 0.9, 1.5}, {tMax, 20, 200}]
```

Out[ ]=



NDSolve: 在 t == 3.1154616436382567` 处，步长实际上为零；可能存在奇点或者刚性系统.

NDSolve: 在 t == 3.1593025611020686` 处，步长实际上为零；可能存在奇点或者刚性系统.

NDSolve: 在 t == 445.6496069733122` 处误差测试失败；无法继续.

NDSolve: 在 t == 1.37365212132476` 处，步长实际上为零；可能存在奇点或者刚性系统.

NDSolve: 在 t == 0.8774242262396175` 处，步长实际上为零；可能存在奇点或者刚性系统.

NDSolve: 在 t == 50.9235640149503` 处，步长实际上为零；可能存在奇点或者刚性系统.

NDSolve: 在 t == 50.9235640149503` 处，步长实际上为零；可能存在奇点或者刚性系统.

NDSolve: 在 t == 485.1924821350333` 处误差测试失败；无法继续.

NDSolve: 在 t == 434.8056318328504` 处误差测试失败；无法继续.

NDSolve: 在 t == 460.76328096893275` 处误差测试失败；无法继续.

NDSolve::ndnum: 在 t == 0. 处碰到一个导数的非数值量.

ReplaceAll::reps:
{NDSolve[{x'[t] == α x[t] + ψ x[t]^2 − β y[t] − γ z[t] − δ y[t] z[t],
y'[t] == −(α x[t]) − ϵ Abs[z[t]] x[t] + β y[t] + θ y[t]^2 + γ z[t],
<<3>>, z[0] == 1.114}, {x, y, z}, {t, 500}]}
既不是替换规则列表，也不是一个有效的分派表，因此无法用来替换.

NDSolve::dsvar: 0.00167923 不能用作变量.

ReplaceAll::reps:
{NDSolve[{x'[0.00167923] == α x[0.00167923] + ψ x[0.00167923]^2 −
β y[0.00167923] − γ z[0.00167923] − δ y[0.00167923] z[0.00167923],
<<4>>, z[0] == 1.114}, {x, y, z}, {0.00167923, 500}]}
既不是替换规则列表，也不是一个有效的分派表，因此无法用来替换.

NDSolve::dsvar: 0.00167923 不能用作变量.

ReplaceAll::reps:
{NDSolve[{x'[0.00167923] == α x[0.00167923] + ψ x[0.00167923]^2 −
1. β y[0.00167923] − 1. γ z[0.00167923] −
1. δ y[0.00167923] z[0.00167923], <<4>>, z[0.] == 1.114}, {x, y, z},
{<<2>>}]} 既不是替换规则列表，也不是一个有效的分派表，因此无法用来替换.

General::stop: 在本次计算中，ReplaceAll::reps 的进一步输出将被抑制.

NDSolve::dsvar: 1.67923 不能用作变量.

General::stop: 在本次计算中，NDSolve::dsvar 的进一步输出将被抑制.

NDSolve: 在 t == 22.889105268731754` 处，步长实际上为零；可能存在奇点或者刚性系统.

NDSolve: 在 t == 22.889105268731754` 处，步长实际上为零；可能存在奇点或者刚性系统.

```
(*For this case, before the initial condiction,
when we close to initial condiction, the points are stable ,
physical consistent.statble situation, if go infinitely,
the module will break down. situation 2: when we close to the initial condition,
when we change this module is still keep
 stable. if we get the different part with paper  *)
```

```
(* Case 2*)
```

In[ ]:=
```
ClearAll
```

Out[ ]=
```
ClearAll
```

In[ ]:=
```
α = 0.07;
β = 0.01;
γ = 0.01;
δ = 0.02;
ϵ = 0.04;
ξ = 0.03;
η = 0.03;
Θ = 5.0;
ψ = -0.1;

s = NDSolve[{x'[t] == α x[t] + β y[t] - γ z[t] + ψ x[t]^2 - δ z[t] × y[t],
    y'[t] == β y[t] - α x[t] + γ z[t] + Θ y[t]^2 - ϵ Abs[z[t]] × x[t],
    z'[t] == ξ + γ z[t] - α x[t] + β y[t] - η x[t] × Abs[y[t]],
    x[0] == 0.4954 , y[0] == 0.0898, z[0] == 0.6684}, {x, y, z}, {t, 400}]
```

Out[ ]=

$$\left\{\left\{x \to \text{InterpolatingFunction}\left[\langle\text{Domain: } \{\{0.,\ 400.\}\} \text{ Output: scalar}\rangle\right],\right.\right.$$

$$y \to \text{InterpolatingFunction}\left[\langle\text{Domain: } \{\{0.,\ 400.\}\} \text{ Output: scalar}\rangle\right],$$

$$\left.\left.z \to \text{InterpolatingFunction}\left[\langle\text{Domain: } \{\{0.,\ 400.\}\} \text{ Output: scalar}\rangle\right]\right\}\right\}$$

```
Manipulate[Plot [Evaluate[ {x[t], y[t], z[t]} /.
     NDSolve[{x'[t] == α x[t] + β y[t] - γ z[t] + ψ x[t]^2 - δ z[t] × y[t],
       y'[t] == β y[t] - α x[t] + γ z[t] + Θ y[t]^2 - ϵ Abs[z[t]] × x[t],
       z'[t] == ξ + γ z[t] - α x[t] + β y[t] - η x[t] × Abs[y[t]],
       x[0] == x0, y[0] == y0, z[0] == z0}, {x, y, z}, {t, 500} ]],
  {t, 0, 20}], {x0, 0.5, 1.5}, {y0, 0.1, 0.4}, {z0, 0.7, 1}]
```