1. Solve Differential equation: y'(x)+ y(x) = sinx.

In[7]:=
```
DSolve[y'[x] + y[x] == Sin[x], y[x], x]
```

Out[7]=
$$\left\{\left\{y[x] \to e^{-x} c_1 + \frac{1}{2}\left(-\text{Cos}[x] + \text{Sin}[x]\right)\right\}\right\}$$

2. Solve Differential equation with boundary condition: y'(x)+ y(x) = sinx, y(0)=0

In[16]:=
```
Clear[y, x]
DSolve[{y'[x] + y[x] == Sin[x], y[0] == 0},
y[x], x]
```

Out[17]=
$$\left\{\left\{y[x] \to -\frac{1}{2} e^{-x}\left(-1 + e^{x}\,\text{Cos}[x] - e^{x}\,\text{Sin}[x]\right)\right\}\right\}$$

In[18]:=
```
Simplify[{{y[x] → -1/2 e^-x (-1 + e^x Cos[x] - e^x Sin[x])}}]
```

Out[18]=
$$\left\{\left\{y[x] \to \frac{1}{2}\left(e^{-x} - \text{Cos}[x] + \text{Sin}[x]\right)\right\}\right\}$$

3. Solve the boundary value problem and plot the solution for: y''(x) - x * y(x) = 0, y(0) = 1, y(9) = 1

In[37]:=
```
Clear[y, x]
sol = DSolve[{y''[x] - x y[x] == 0, y[0] ==
1, y[9] == 1}, y[x], x]
```

Out[38]=
$$\left\{\left\{y[x] \to \frac{\sqrt{3}\ \text{AiryAi}[x] - \text{AiryBi}[x] - 3^{2/3}\,\text{AiryAi}[x] \times \text{AiryBi}[9] \times \text{Gamma}\left[\frac{2}{3}\right] + 3^{2/3}\,\text{AiryAi}[9] \times \text{AiryBi}[x] \times \text{Gamma}\left[\frac{2}{3}\right]}{\sqrt{3}\ \text{AiryAi}[9] - \text{AiryBi}[9]}\right\}\right\}$$

In[43]:=
```
ySol[x_] = Evaluate[y[x] /. sol[[1]]]
```

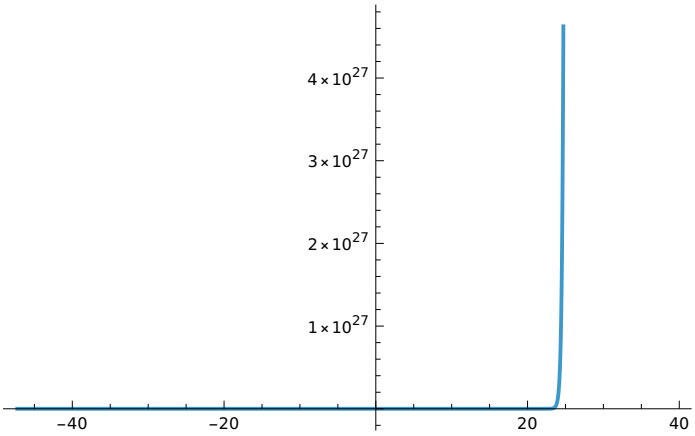
Out[43]=
$$\frac{\sqrt{3}\ \text{AiryAi}[x] - \text{AiryBi}[x] - 3^{2/3}\,\text{AiryAi}[x] \times \text{AiryBi}[9] \times \text{Gamma}\left[\frac{2}{3}\right] + 3^{2/3}\,\text{AiryAi}[9] \times \text{AiryBi}[x] \times \text{Gamma}\left[\frac{2}{3}\right]}{\sqrt{3}\ \text{AiryAi}[9] - \text{AiryBi}[9]}$$

In[40]:=
```
FullSimplify[ySol[x]]
```

Out[40]=
$$\frac{\sqrt{3}\ \text{AiryAi}[x] - \text{AiryBi}[x] + \frac{(\text{AiryAi}[x] \times \text{AiryBi}[9] - \text{AiryAi}[9] \times \text{AiryBi}[x])\ \text{Gamma}\left[-\frac{1}{3}\right]}{3^{1/3}}}{\sqrt{3}\ \text{AiryAi}[9] - \text{AiryBi}[9]}$$

In[41]:=
$$\text{Plot}\left[\frac{\sqrt{3}\ \text{AiryAi}[x]-\text{AiryBi}[x]+\frac{(\text{AiryAi}[x]\times\text{AiryBi}[9]-\text{AiryAi}[9]\times\text{AiryBi}[x])\ \text{Gamma}\left[-\frac{1}{3}\right]}{3^{1/3}}}{\sqrt{3}\ \text{AiryAi}[9]-\text{AiryBi}[9]},\ \{x,\ -47.25,\ 39.75\}\right]$$

Out[41]=



4. Plot the graph for y(x) when x is between -10 and 10.

In[45]:=
```
Plot[Evaluate[y[x] /. sol[[1]]], {x, -10, 10}]
```

Out[45]=