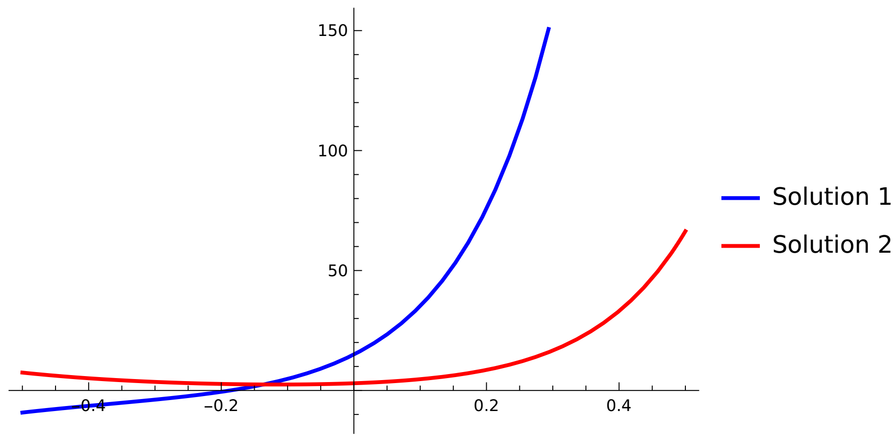
In[13]:=
```
eqn = y'''[x] - 4*y''[x] - 25*y'[x] + 28*y[x] == 0;
sol = DSolve[eqn, y[x], x];

sol1 = sol /. {C[1] → -1, C[2] → -4, C[3] → 20};
sol2 = sol /. {C[1] → 1, C[2] → 0, C[3] → 2};

Plot[{y[x] /. sol1, y[x] /. sol2}, {x, -0.5, 0.5},
 PlotLegends → {"Solution 1", "Solution 2"},
 PlotStyle → {Blue, Red}]
```

Out[17]=

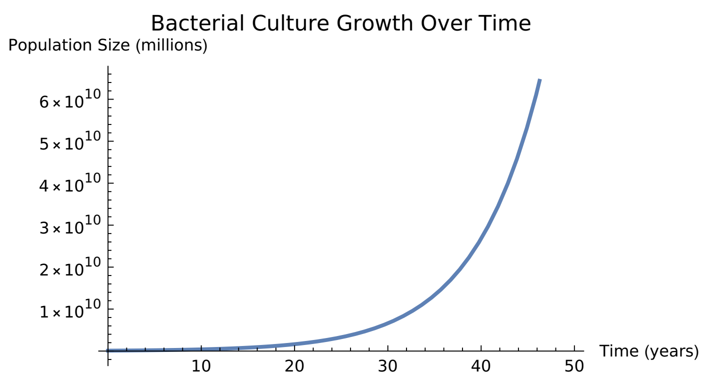


In[18]:=
```
initialPopulation = 100 000 000;
growthRate = 0.15;

size[t_] := initialPopulation * (1 + growthRate)^t;

Plot[size[t], {t, 0, 50},
 PlotLabel → "Bacterial Culture Growth Over Time",
 AxesLabel → {"Time (years)", "Population Size (millions)"}]
```

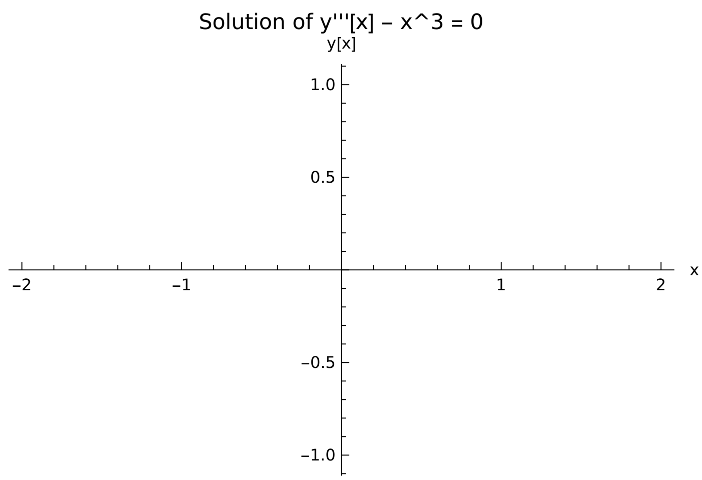
Out[21]=



In[30]:=
```
eqn = y'''[x] - x^3 == 0;
sol = DSolve[eqn, y[x], x];

Plot[y[x] /. sol, {x, -2, 2},
 PlotLabel → "Solution of y'''[x] - x^3 = 0",
 AxesLabel → {"x", "y[x]"}]
```

Out[32]=

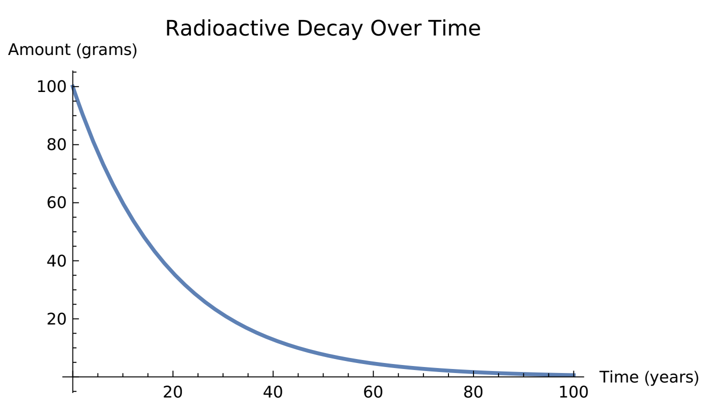


In[33]:=
```
initialAmount = 100;
decayRate = 0.05;

amount[t_] := initialAmount * (1 - decayRate)^t;

Plot[amount[t], {t, 0, 100},
 PlotLabel → "Radioactive Decay Over Time",
 AxesLabel → {"Time (years)", "Amount (grams)"}]
```

Out[36]=



In[37]:=
```
V = 50;
F = 80;
cin = 3;
eqn = y'[t] == (F / V) * (cin - y[t]);
solutions = Table[
  sol = NDSolve[{eqn, y[0] == initialCondition}, y, {t, 0, 10}];
  y[t] /. sol,
  {initialCondition, 0, 8, 1}];
Plot[solutions, {t, 0, 10},
 PlotLabel → "Lake Pollution Model",
 AxesLabel → {"Time (years)", "Concentration (parts per million)"},
 PlotLegends → Table["y[0] = " <> ToString[i], {i, 0, 8}],
 PlotRange → {Automatic, {0, 5}}]
```

Out[42]=