Practical - 8

Plot the integral surfaces of a given first order partial differential equation with initial data

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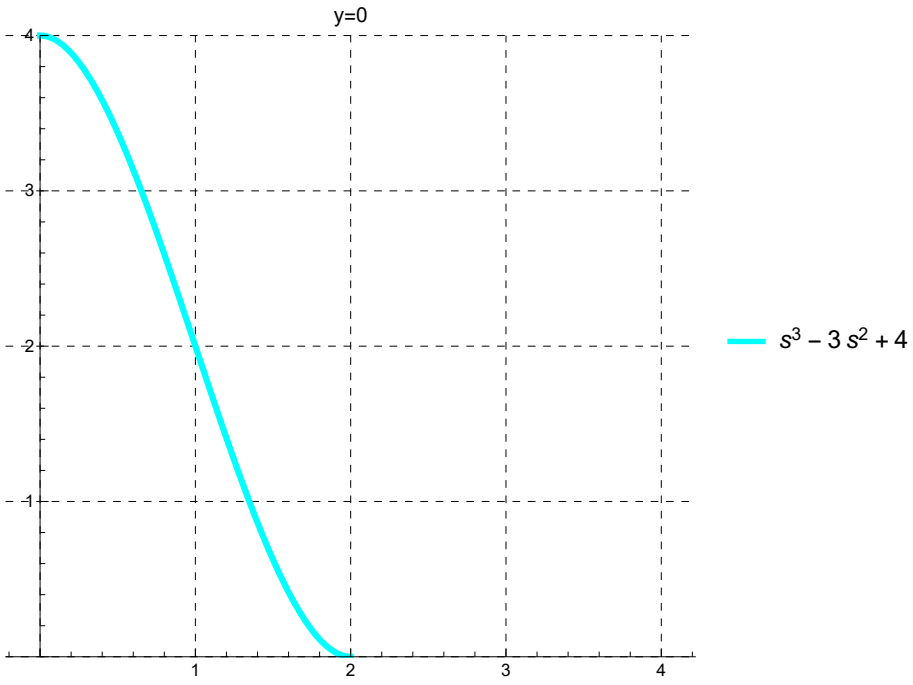
In[67]:=

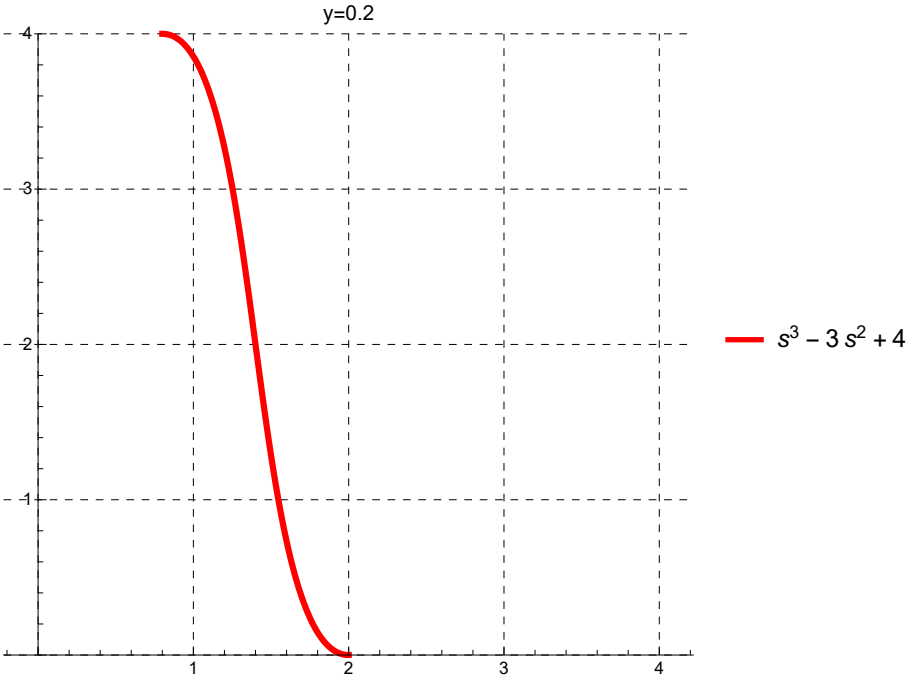
```
u[s_] := (s^3) - 3 * (s^2) + 4
x[s_, t_] := s + t * u[s]
h0 = ParametricPlot[{x[s, 0], u[s]}, {s, 0, 2}, PlotRange → {0, 4},
  PlotLabel → "y=0", PlotStyle → {Thickness[0.009], Cyan}, PlotLegends → {u[s]},
  GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]]
```

Out[69]=



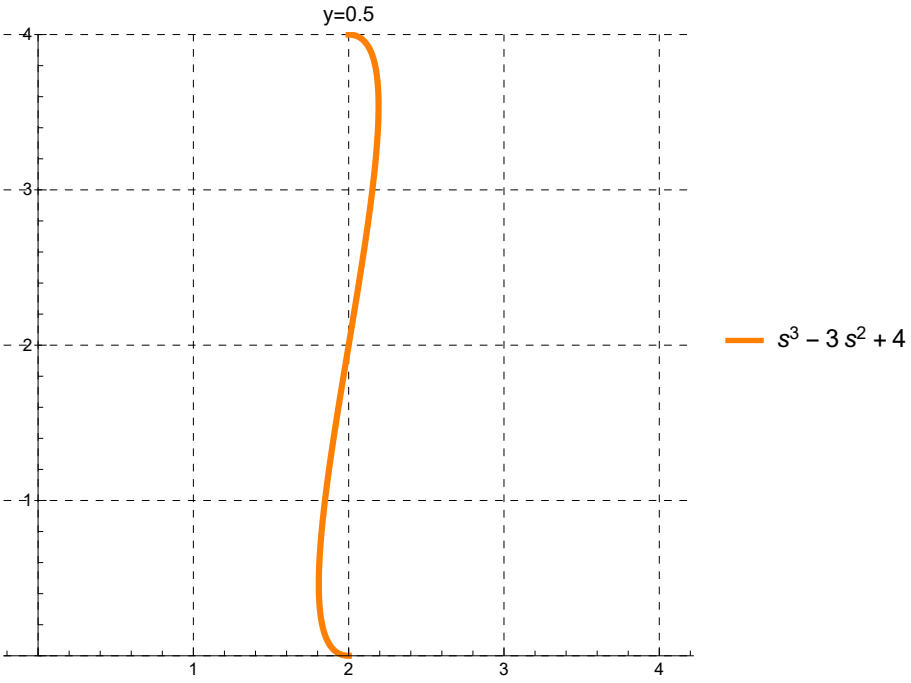
In[70]:=
```
h0 = ParametricPlot[{x[s, 0.2], u[s]}, {s, 0, 2}, PlotRange → {0, 4},
  PlotLabel → "y=0.2", PlotStyle → {Thickness[0.009], Red}, PlotLegends → {u[s]},
  GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]]
```

Out[70]=



In[71]:=
```
h0 = ParametricPlot[{x[s, 0.5], u[s]}, {s, 0, 2}, PlotRange → {0, 4},
  PlotLabel → "y=0.5", PlotStyle → {Thickness[0.009], Orange}, PlotLegends → {u[s]},
  GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]]
```

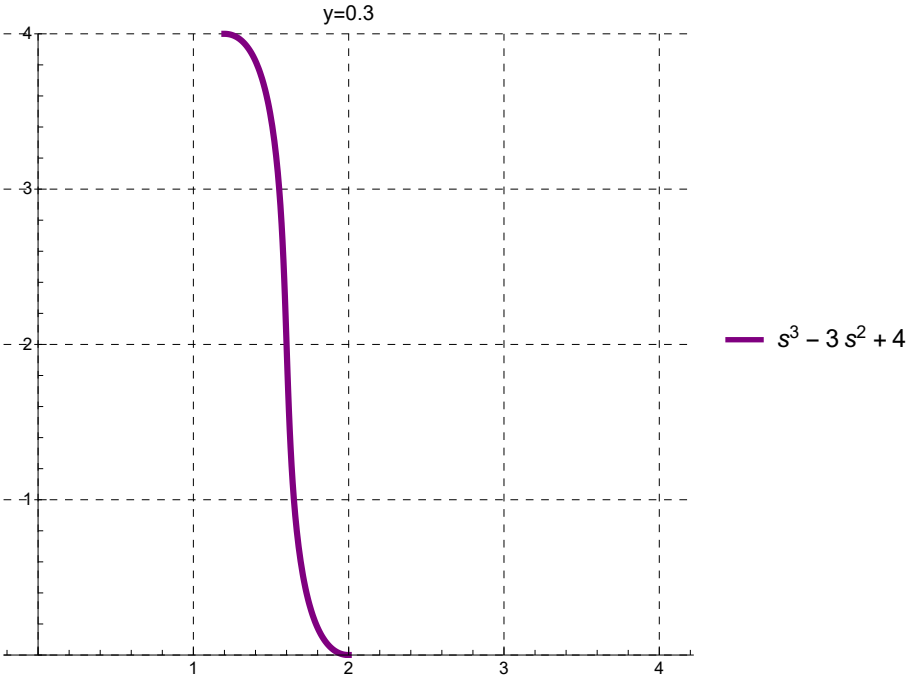
Out[71]=



In[72]:=

```
h0 = ParametricPlot[{x[s, 0.3], u[s]}, {s, 0, 2}, PlotRange → {0, 4},
  PlotLabel → "y=0.3", PlotStyle → {Thickness[0.009], Purple}, PlotLegends → {u[s]},
  GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]]
```

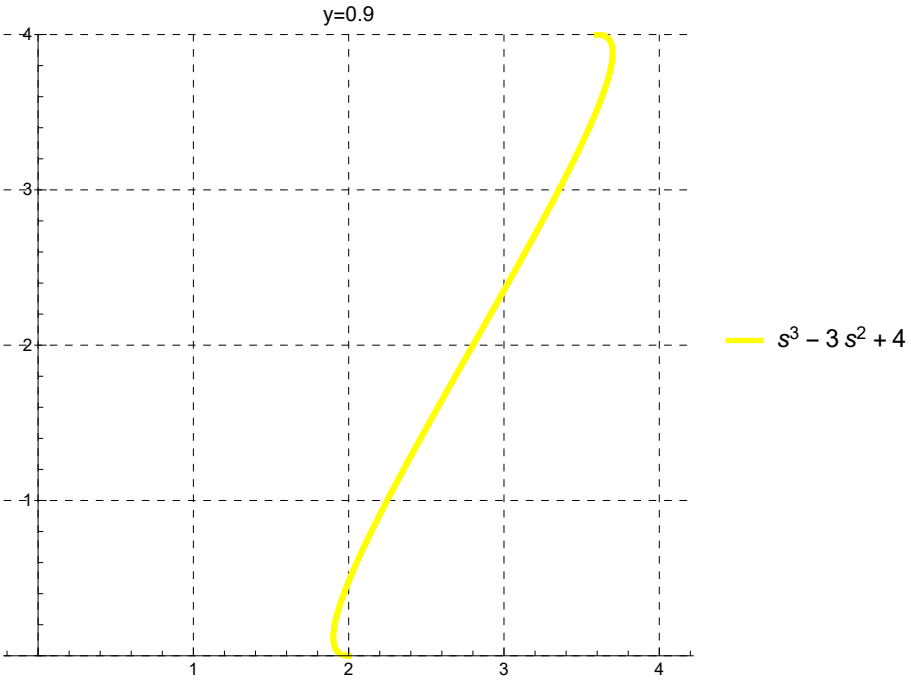
Out[72]=



In[73]:=

```
h0 = ParametricPlot[{x[s, 0.9], u[s]}, {s, 0, 2}, PlotRange → {0, 4},
  PlotLabel → "y=0.9", PlotStyle → {Thickness[0.009], Yellow}, PlotLegends → {u[s]},
  GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]]
```

Out[73]=



Creating function for making integral surfaces

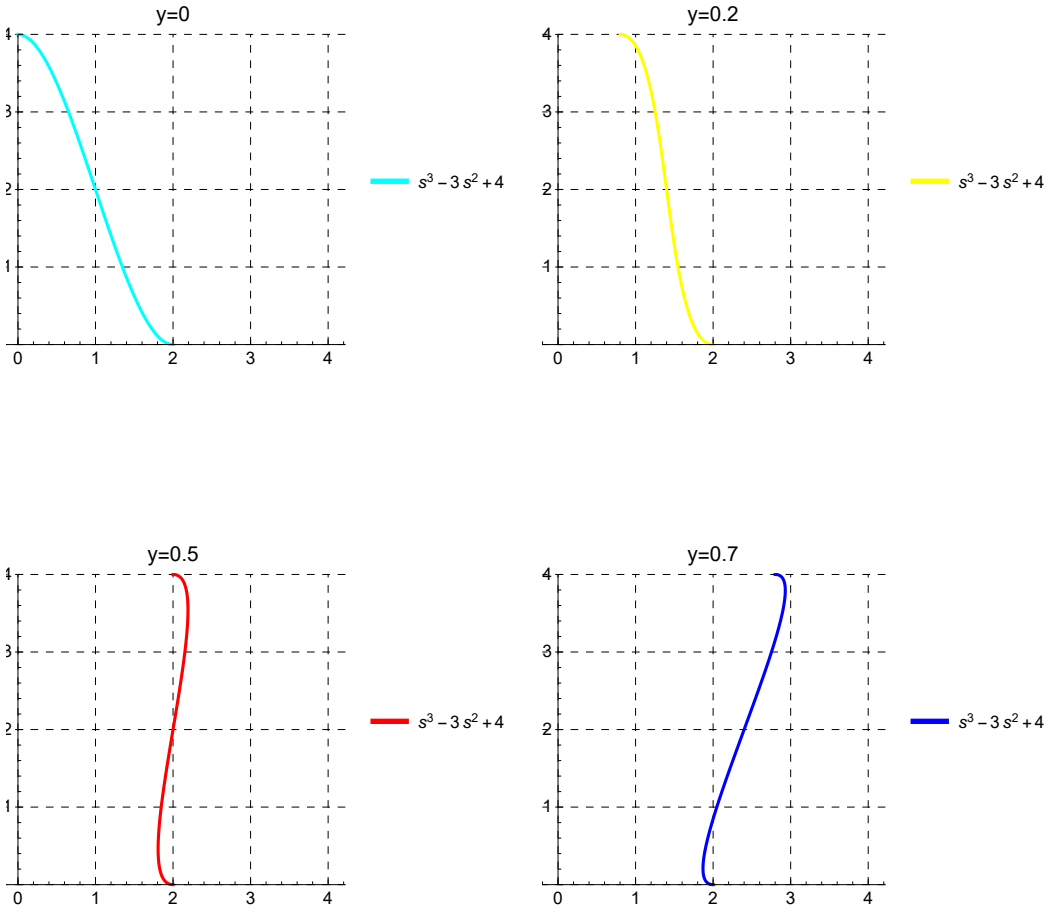
In[116]:=

```
integralplot[u[s_], x[s_, t_] ] := Block[{h0},
  h1 = ParametricPlot[{x[s, 0], u[s]}, {s, 0, 2}, PlotRange → {0, 4},
    PlotLabel → "y=0", PlotStyle → {Thickness[0.009], Cyan}, PlotLegends → {u[s]},
    GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]];
  h2 = ParametricPlot[{x[s, 0.2], u[s]}, {s, 0, 2}, PlotRange → {0, 4},
    PlotLabel → "y=0.2", PlotStyle → {Thickness[0.009], Yellow}, PlotLegends → {u[s]},
    GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]];
  h3 = ParametricPlot[{x[s, 0.5], u[s]}, {s, 0, 2}, PlotRange → {0, 4},
    PlotLabel → "y=0.5", PlotStyle → {Thickness[0.009], Red}, PlotLegends → {u[s]},
    GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]];
  h4 = ParametricPlot[{x[s, 0.7], u[s]}, {s, 0, 2}, PlotRange → {0, 4},
    PlotLabel → "y=0.7", PlotStyle → {Thickness[0.009], Blue}, PlotLegends → {u[s]},
    GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]];
  Show[GraphicsArray[{{h1, h2}, {h3, h4}}]]]
```

In[117]:=
```
integralplot[(s^3) - 3 * (s^2) + 4, s + t * u[s]]
```

... GraphicsArray: GraphicsArray is obsolete. Switching to GraphicsGrid.

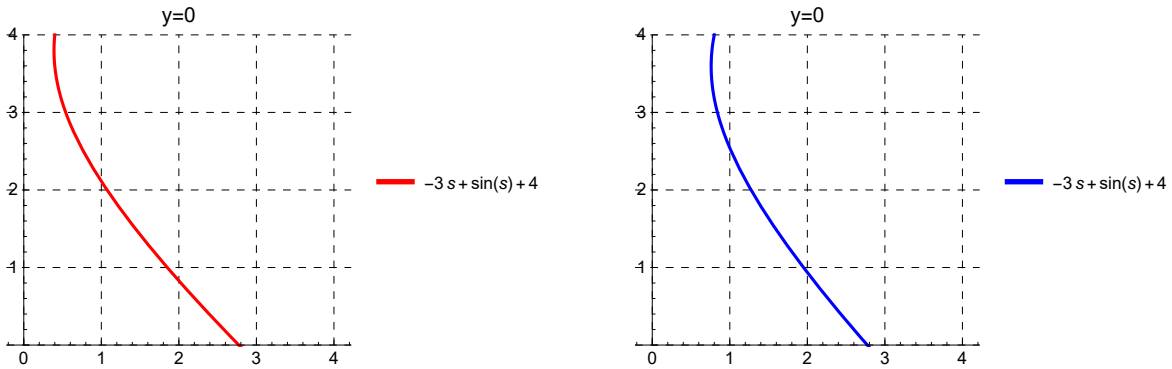
Out[117]=



In[557]:=

```
u[s_] := Sin[(s)] - 3 * (s) + 4
x[s_, t_] := s^2 + t * u[s]
h0 := ParametricPlot[{x[s, 0], u[s]}, {s, 0, 5}, PlotRange → {0, 4},
  PlotLabel → "y=0", PlotStyle → {Thickness[0.009], Cyan}, PlotLegends → {u[s]},
  GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]]
h1 := ParametricPlot[{x[s, 0.1], u[s]}, {s, 0, 5}, PlotRange → {0, 4},
  PlotLabel → "y=0", PlotStyle → {Thickness[0.009], Red}, PlotLegends → {u[s]},
  GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]]
h2 := ParametricPlot[{x[s, 0.2], u[s]}, {s, 0, 5}, PlotRange → {0, 4},
  PlotLabel → "y=0", PlotStyle → {Thickness[0.009], Blue}, PlotLegends → {u[s]},
  GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]]
h3 := ParametricPlot[{x[s, 0.3], u[s]}, {s, 0, 5}, PlotRange → {0, 4},
  PlotLabel → "y=0", PlotStyle → {Thickness[0.009], Orange}, PlotLegends → {u[s]},
  GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]]
h4 := ParametricPlot[{x[s, 0.4], u[s]}, {s, 0, 5}, PlotRange → {0, 4},
  PlotLabel → "y=0", PlotStyle → {Thickness[0.009], Black}, PlotLegends → {u[s]},
  GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]]
h5 := ParametricPlot[{x[s, 0.5], u[s]}, {s, 0, 5}, PlotRange → {0, 4},
  PlotLabel → "y=0", PlotStyle → {Thickness[0.009], Brown}, PlotLegends → {u[s]},
  GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]]
h6 := ParametricPlot[{x[s, 0.6], u[s]}, {s, 0, 5}, PlotRange → {0, 4},
  PlotLabel → "y=0", PlotStyle → {Thickness[0.009], Yellow}, PlotLegends → {u[s]},
  GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]]
h7 := ParametricPlot[{x[s, 0.7], u[s]}, {s, 0, 5}, PlotRange → {0, 4},
  PlotLabel → "y=0", PlotStyle → {Thickness[0.009], Purple}, PlotLegends → {u[s]},
  GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]]
h8 := ParametricPlot[{x[s, 0.8], u[s]}, {s, 0, 5}, PlotRange → {0, 4},
  PlotLabel → "y=0", PlotStyle → {Thickness[0.009], Red}, PlotLegends → {u[s]},
  GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]]
h9 := ParametricPlot[{x[s, 0.9], u[s]}, {s, 0, 5}, PlotRange → {0, 4},
  PlotLabel → "y=0", PlotStyle → {Thickness[0.009], Blue}, PlotLegends → {u[s]},
  GridLines → Automatic, GridLinesStyle → Directive[Black, Dashed]]
Show[GraphicsArray[{{h1, h2, h3}, {h4, h5, h6}, {h7, h8, h9}}], FrameTicks -> None]
```

GraphicsArray: GraphicsArray is obsolete. Switching to GraphicsGrid.



Out[569]=