Diferencialne operacije

In[1]:=
```
f[t_] := a t^2 + b t + c
```

In[2]:=
```
res = Solve[{f[-h] == f1, f[0] == f2, f[h] == f3}, {a, b, c}][[1]]
```

Out[2]= $\left\{a \to -\frac{-f1 + 2\,f2 - f3}{2\,h^2},\ b \to -\frac{f1 - f3}{2\,h},\ c \to f2\right\}$

In[3]:=
```
(* prvi odvod - enakomeren korak *)
{HoldForm[f'[-h]] == Simplify[f'[-h] /. res],
  HoldForm[f'[0]] == Simplify[f'[0] /. res],
  HoldForm[f'[h]] == Simplify[f'[h] /. res]} // TableForm
```

Out[3]//TableForm=

$f'[-h] == -\frac{3\,f1 - 4\,f2 + f3}{2\,h}$

$f'[0] == \frac{-f1 + f3}{2\,h}$

$f'[h] == \frac{f1 - 4\,f2 + 3\,f3}{2\,h}$

In[4]:=
```
(* drugi odvod - enakomeren korak *)
{HoldForm[f''[-h]] == Simplify[f''[-h] /. res],
  HoldForm[f''[0]] == Simplify[f''[0] /. res],
  HoldForm[f''[h]] == Simplify[f''[h] /. res]} // TableForm
```

Out[4]//TableForm=

$f''[-h] == \frac{f1 - 2\,f2 + f3}{h^2}$

$f''[0] == \frac{f1 - 2\,f2 + f3}{h^2}$

$f''[h] == \frac{f1 - 2\,f2 + f3}{h^2}$

In[5]:=

In[6]:=
```
s = Import["~/vaje/rovf12/vaja5/kamen.dat", {"Data", All, {1, 2}}];
v = Import["~/vaje/rovf12/vaja5/kamen.dat", {"Data", All, {1, 3}}];
a = Import["~/vaje/rovf12/vaja5/kamen.dat", {"Data", All, {1, 4}}];
```

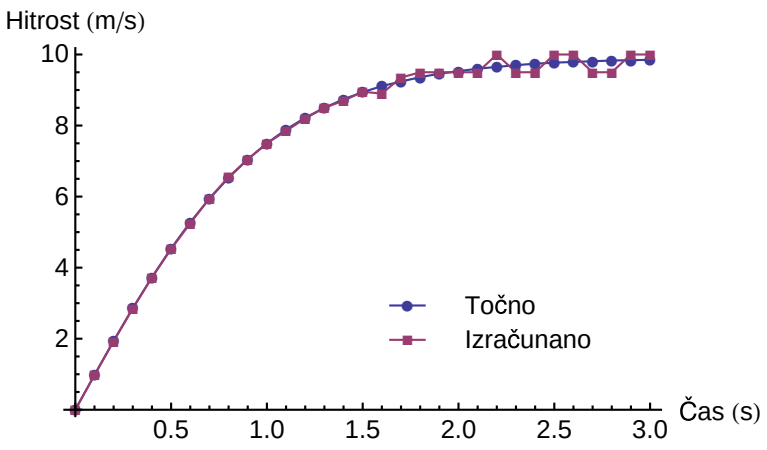
In[9]:=
```
odvod1[s_] := Module[{n, h},
  n = Length[s];
  h = s[[2, 1]] - s[[1, 1]];
  Join[{{s[[1, 1]], -(s[[3, 2]] - 4 s[[2, 2]] + 3 s[[1, 2]]) / (2 h)}},
   Table[{s[[i, 1]], (s[[i + 1, 2]] - s[[i - 1, 2]]) / (2 h)}, {i, 2, n - 1}],
   {{s[[n, 1]], (s[[n - 2, 2]] - 4 s[[n - 1, 2]] + 3 s[[n, 2]]) / (2 h)}}]
 ]

odvod2[s_] := Module[{n, h},
  n = Length[s];
  h = s[[2, 1]] - s[[1, 1]];
  Join[{{s[[1, 1]], (s[[3, 2]] - 2 s[[2, 2]] + s[[1, 2]]) / h^2}},
   Table[{s[[i, 1]], (s[[i + 1, 2]] - 2 s[[i, 2]] + s[[i - 1, 2]]) / h^2}, {i, 2, n - 1}],
   {{s[[n, 1]], (s[[n, 2]] - 2 s[[n - 1, 2]] + s[[n - 2, 2]]) / h^2}}]
 ]

integral[s_] := Module[{n, h, int},
  n = Length[s];
  h = s[[2, 1]] - s[[1, 1]];
  int = {{s[[1, 1]], 0}};
  For[i = 2, i ≤ n, ++i,
   int = Append[int, {s[[i, 1]], int[[-1, 2]] + 0.5 h (s[[i - 1, 2]] + s[[i, 2]])}]
  ];
  int
 ]
```

In[12]:=
```
SetOptions[ListPlot, Joined → True, ImageSize → 5 × 72,
  PlotStyle → Directive[Thickness[Medium]],
  TicksStyle → Thickness[Medium], AxesStyle → Thickness[Medium],
  LabelStyle → Directive[FontFamily → "Helvetica", FontSize → 12]];
```

In[13]:=
```
Needs["PlotLegends`"]
SetOptions[Legend, LegendShadow → False,
  LegendBorder → False, LegendSpacing → 0, LegendSize → {0.6, 0.2}];
st[x_] := Style[x, FontFamily → "Helvetica", FontSize → 12]
```

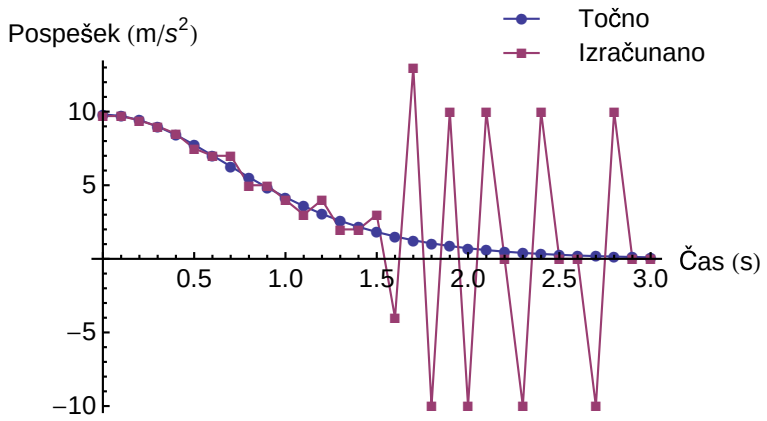
In[16]:=
```
ListPlot[{v, odvod1[s]},
 AxesLabel → {"Čas (s)", "Hitrost (m/s)"}, PlotMarkers → {Automatic, 8},
 PlotLegend → {st["Točno"], st["Izračunano"]}, LegendPosition → {0, -0.4}]
```

Out[16]=



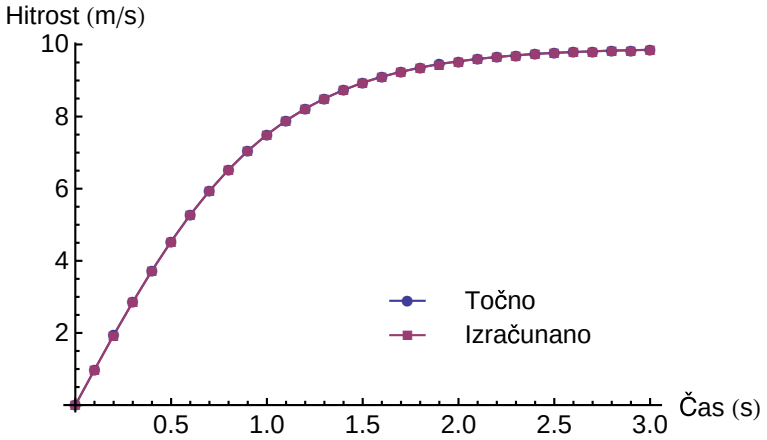
In[17]:=
```
ListPlot[{a, odvod2[s]},
 AxesLabel → {"Čas (s)", "Pospešek (m/s^2)"}, PlotMarkers → {Automatic, 8},
 PlotLegend → {st["Točno"], st["Izračunano"]}, LegendPosition → {0.3, 0.3}]
```

Out[17]=



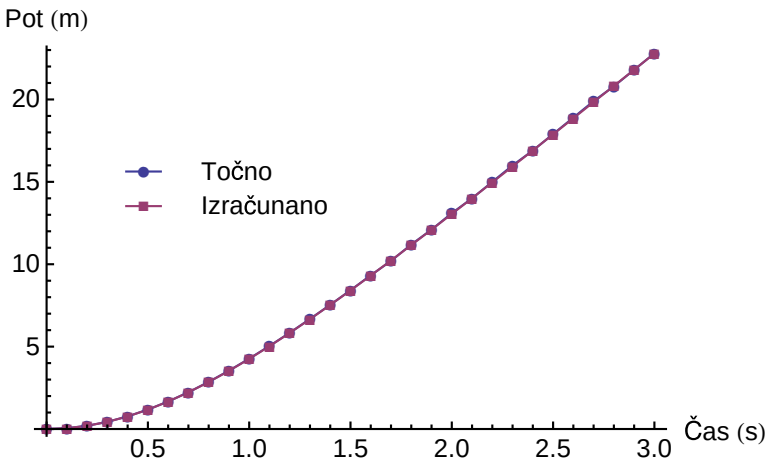
In[18]:=
```
ListPlot[{v, integral[a]},
 AxesLabel → {"Čas (s)", "Hitrost (m/s)"}, PlotMarkers → {Automatic, 8},
 PlotLegend → {st["Točno"], st["Izračunano"]}, LegendPosition → {0, -0.4}]
```

Out[18]=



In[19]:=
```
ListPlot[{s, integral[integral[a]]},
 AxesLabel → {"Čas (s)", "Pot (m)"}, PlotMarkers → {Automatic, 8},
 PlotLegend → {st["Točno"], st["Izračunano"]}, LegendPosition → {-0.7, 0}]
```

Out[19]=



Naloga 1: Nariši graf diferencialne upornosti d*U*/d*I* za tokovno odvisnost v datoteki *Korozija.dat*. To je meritev karakteristike *I*-*U* za kovinsko elektrodo v določeni korozivni raztopini (prvi stolpec *U* [mV], drugi *I* [A]).

Naloga 2: Datoteka *body_acc.txt* vsebuje podatke o kartezičnih komponentah vektorja pospeška premikajoče se osebe (komponente *x*, *y* in *z* pospeška v enotah g=9.81 m/s^{2}so v prvem, drugem in tretjem stolpcu datoteke). Akcelerometer v mobilnem telefonu, ki ga je oseba nasila na pasu, je podatke o pospešku zapisoval s frekvenco 50 Hz. Nariši graf položaja osebe v odvisnosti od časa.

Naloga 3: V datoteki *prevajanje.dat* je podan temperaturni profil v 0.1 m debeli steni v odvisnosti od časa. V prvem stolpcu je podana oddaljenost (v metrih) merilne točke od levega roba stene, v ostalih stolpcih pa so temperature (v stopinjah Celzija) na teh mestih ob časih od 0 s do 180 s s korakom 1 s. (a) Kako se s časom spreminjata toplotna tokova na obeh robovih stene? (b) Ob času t=1 min primerjaj krajevno odvisnost odvoda temperature po času s krajevno odvisnostjo drugega odvoda temperature po kraju.