Finites Differences
Free fall

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Pseudocode of differentiation process

Pseucode of Free fall program

```
START

Import libreries
Declare constant float g = 9.80665, dt = 0.01
Declare y0, v0 as doubles and ext as string

Show "Enter the initial position, initial velocity and output file extension: "
Read y0, v0, ext

Declare vectors t, y, v, yt, vt.
Initialize vectors with 0 for the times vector, y0 and v0 for the position and
velocity vectors.

Create and open file "table.<ext>" with the extension provided by user.
Create and open file "plot.gp"
Write header in the output file.

For i = 0 incremented by 1, as long as y is greater than 0:
  Add dt * (i + 1) to t
  Add y[i] + v[i] * dt to y
  Add v[i] - g * dt to v
  Add y0 + v0 * t[i+1] - 0.5 * g * pow(t[i+1], 2) to yt
  Add v0 - g * t[i+1] to vt
  Write t[i], y[i], v[i], yt[i], vt[i] to output file.
ForEnd

Write gnuplot commands to plot.gp to plot:
  A graph of position vs time
  A graph of velocity vs time

Close output file and plot.gp.
Execute plot.gp

END
```

Flowchart of differentiation process