

Direction Fields

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A notebook to illustrate how to draw a direction field for an ODE.

Consider an ODE $u'(t) = t \cos(u(t)) - \sin(t)$. Define the right side of this ODE as a function $f(t,u) = t \cos(u) - \sin(t)$:

```
In[1]:= f[t_, u_] = t * Cos[u] - Sin[t]
```

The direction field (i.e., vector field or slope field) can be sketched (in red) with

```
In[8]:= VectorPlot[{1, f[t, u]}, {t, 0, 5}, {u, 0, 5},  
  VectorColorFunction -> None, VectorStyle -> Red]
```

Or superimpose the graphs of solutions to $u' = f(t,u)$ in blue with

```
In[10]:= VectorPlot[{1, f[t, u]}, {t, 0, 5}, {u, 0, 5},  
  StreamPoints -> Coarse, VectorColorFunction -> None,  
  VectorStyle -> Red, StreamColorFunction -> None, StreamStyle -> Blue]
```