Org Mode ConTeXt Export Demo

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Contents

1 Problem 1

Problem Evaluate numerically the integral

$$I = \int_0^{\pi/2} \ln(\sin x)\, dx$$

and compare with the exact value $I = -\frac{\pi}{2}\ln 2$

Solution ...

Note that $\ln(\sin x) = \ln\left(x\frac{\sin x}{x}\right) = \ln x + \ln\frac{\sin x}{x}$
Therefore we just need to find $\int_0^{\pi/2} \ln x dx$ analytically and evaluate $\int_0^{\pi/2} \ln\frac{\sin x}{x} dx$ numerically.
$\int_0^{\pi/2} \ln x dx$ can be integrated by parts.
Let $u = \ln x, v^{'} = dx, u^{'} = \frac{1}{x}, v = x$. Therefore,

$$\int lnxdx = \int uv^{'}dx = uv - \int vu^{'}dx$$

$$uv - \int vu^{'}dx = x\ln x - \int x\frac{1}{x}dx = x\ln x - x$$

And so, $\int_0^{\pi/2} \ln x dx = x\ln x - x|_0^{\pi/2}$

$$\frac{d^4}{dx^4}e^{ax} + e^{ax} = 0$$
$$a^4e^{ax} + e^{ax} = 0$$
$$a^4 + 1 = 0$$
$$a^4 = -1$$

And, $\int_0^{\pi/2} \ln x dx = \frac{pi}{2}(\ln x - 1) \approx -0.861$

```
1  from sympy import log, pi, integrate
2  from sympy.abc import x
3  print((pi/2 * (log(pi/2) - 1)).evalf())
4  print(integrate(log(x), (x, 0, pi/2)).evalf())
```

```
1  -0.861451872082119
2  -0.861451872082119
```

So we have a value for part of our problem. The other part is to evaluate the integral

$$\int_0^{\pi/2} \ln \frac{\sin x}{x} dx$$

We can do this with Simpson's rule. Recall that

$$S = \frac{H}{9}\sum_{i=0}^{n-1} f(x_0 + iH) + 4f\left(x_0 + \left(i + \frac{1}{2}\right)H\right) + f(x_0 + (i+1)H)$$

```
import matplotlib.pyplot as plt
import numpy as np
x, y = np.meshgrid(np.linspace(0, 1, 25), np.linspace(0, 1, 25))
def slope(x, y):
    return x - y**2
u = np.ones_like(x)
v = slope(x, y)
plt.figure(figsize=(8, 8))
plt.quiver(x, y, u, v, scale=30)
plt.gcf().tight_layout()
plt.plot( np.linspace(0, 1, 11),
          [0.000,0.005,0.020,0.045,0.080,0.124,0.177,0.238,0.306,0.380,0.458]
)
plt.savefig("temp.pdf")
return "temp.pdf"
```

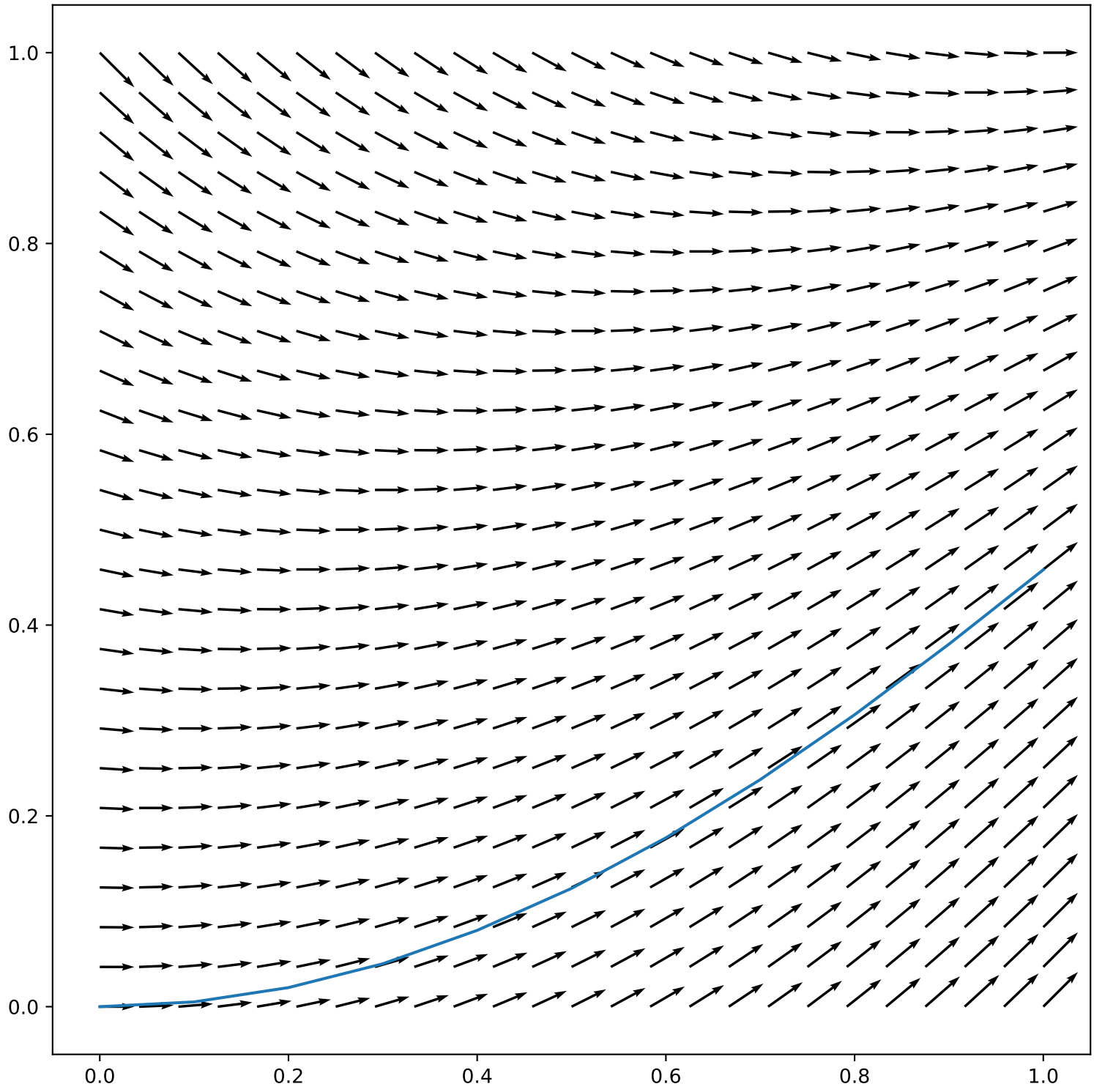

Figure 1 Quiver Plot

1.1 Sample Subheading

- Item
  Some prose
- Item 2
  Some more prose

Here's some prose in the middle

1. Numbered item
   - A subitem
     - ⋆ A subsubitem
2. Another numbered item

Here's some bold *here's some italics* ~~Here's some strikethrough~~ `here's some code` `here's some verbatim` here's some underline!? *Here's some underlined italics*
Here's some junk in a drawer

```
local function s(a)
  if control[s] then
    foo(s)
  end
end
```

```
1  beginfig(1)
2    draw fullcircle scaled 3cm ;
3  endfig ;
4  end ;
```

Here's a link to "**Problem 1**"
Here's a link to **google**
Here's a bare link to **https://orgmode.org**

Thus, I came to the conclusion that the designer of a new system must not only be the implementer and first large–scale user; the designer should also write the first user manual.
The separation of any of these four components would have hurt TEX significantly. If I had not participated fully in all these activities, literally hundreds of improvements would never have been made, because I would never have thought of them or perceived why they were important.
But a system cannot be successful if it is too strongly influenced by a single person. Once the initial design is complete and fairly robust, the real test begins as people with many different viewpoints undertake their own experiments.

1.1.1 **DONE** Sample SubSubHeading `sampletag`

Here's a quote from Donald Knuth:

> *The best programs are written so that computing machines can perform them quickly and so that human beings can understand them clearly. A programmer is ideally an essayist who works with traditional aesthetic and literary forms as well as mathematical concepts, to communicate the way that an algorithm works and to convince a reader that the results will be correct.*

1.1.1.1 Sample SubSubSubHeading

Here's a table

Head 1	**Head 2**
Row 1	Row 2

Table 1

That was the table

1.1.1.1.1 Sample SubSubSubSubHeading

1.1.1.1.1.1 Sample SubSubSubSubSubHeading