

# Org Mode ConTeXt Export Demo

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## 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,

$$\int \ln x dx = \int uv' dx = uv - \int vu' dx$$

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

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

$$\begin{aligned}
 \lim_{x \rightarrow 0} x \ln x &= \lim_{x \rightarrow 0} \frac{\ln x}{\frac{1}{x}} \\
 &= \lim_{x \rightarrow 0} -\frac{\frac{1}{x}}{\frac{1}{x^2}} \\
 &= \lim_{x \rightarrow 0} -x \\
 &= 0
 \end{aligned}$$

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

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

```

1  from math import pi, sin, log
2  num_points = 10000
3  xmin = 0
4  xmax = pi/2
5  def f(x):
6      if x == 0:
7          return 0
8      return log(sin(x)/x)
9  H = (xmax - xmin) / num_points
10 def s(x0, i, H, f):
11     return H/6 * (
12         f(x0 + i * H)
13         + 4 * f(x0 + (i + 1/2) * H)
14         + f(x0 + (i + 1) * H)
15     )
16 print(sum(s(xmin, i, H, f) for i in range(num_points)))

```

-0.22734117306968255

## 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

```
1  local function s(a)
2    if control[s] then
3      foo(s)
4    end
5  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 T<sub>E</sub>X 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.*

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#### 1.1.1.1 Sample SubSubSubHeading

Here's a table

<b>Head 1</b>	<b>Head 2</b>
Row 1	Row 2

That was the table

##### 1.1.1.1.1 Sample SubSubSubSubHeading

##### 1.1.1.1.1.1 Sample SubSubSubSubSubHeading