

```
% !TEX TS-program = sage
```

```
% The following lines are standard LaTeX preamble statements.
```

```
\documentclass[11pt, onside]{amsart}
```

```
\usepackage{geometry}
```

```
\geometry{letterpaper}
```

```
\usepackage[parfill]{parskip}
```

```
\usepackage{graphicx}
```

```
\usepackage{amssymb}
```

```
\usepackage{epstopdf}
```

```
\title{Brief Article}
```

```
\author{The Author}
```

```
% Only one command is required to use Sage within the LaTeX source:
```

```
\usepackage{sagetex}
```

```
\begin{document}
```

```
\maketitle
```

```
\section{Introduction}
```

This is an example of using Sage within a \TeX document. We can compute extended values like

```
$$32^{31} = \sage{32^31}$$
```

We can plot functions like $x \sin x$:

```
\sageplot[width=4in]{plot(x * sin( 30 * x), -1, 1)}
```

We can integrate:

```
$$\int \frac{x^2 + x + 1}{(x - 1)^3 (x^2 + x + 2)} dx = \sage{integrate( (x^2 + x + 1) / ((x - 1)^3 * (x^2 + x + 2)), x)}$$
```

```
\newpage
```

We can perform matrix calculations:

```
$$\sage{matrix([[1, 2, 3], [4, 5, 6], [7, 8, 9]]^3)}$$
```

```
$$AB= \sage{Matrix([[1, 2], [3, 4]])} \sage{Matrix([[5, 6], [6, 8]])} = \sage{Matrix([[1, 2], [3, 4]]) * Matrix([[5, 6], [6, 8]])}$$
```

Plots are fun; here is a second one showing $x \ln x$. The "width" command in the source is sent to the include graphics command in LaTeX rather than to Sage.

```
\sageplot[width=5in]{plot(x * ln(x), 0, 2)}
```

Sage understands mathematical constants and writes them symbolically unless it is told to produce a numerical approximation. The term π below is not in the LaTeX source; instead it is the result of a Sage calculation, as is the numerical value on the other side of the equal sign.

```
The product of  $e$  and  $\pi$  is  $\sage{\pi * e} = \sage{N(\pi * e)}$ .
```

```
\end{document}
```