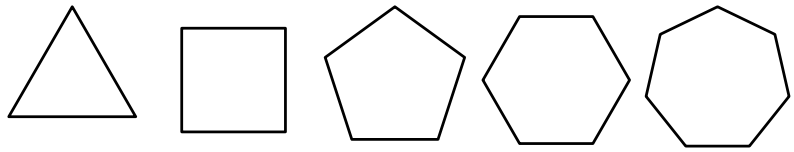
SciComp@UNC: TeXmacs plugins

The public-domain Linux environment encourages compatibility among conforming applications, such that they can work together to solve complex tasks. This approach is in marked contrast to many closed-form commercial operating systems (Windows, macOS) and applications. Even commercial programs (e.g., Mathematica) that conform to standard Linux practices can work in concert with other applications.

Within SciComp@UNC, TeXmacs has been configured to embed sessions of other applications:

Asymptote. A general purpose vector graphics language

```
Asymptote] size(5cm);
          for (int n = 3; n <= 7; ++n) {
          draw(shift(2.2*n, 0) *
          polygon(n));}
```



```
Asymptote]
```

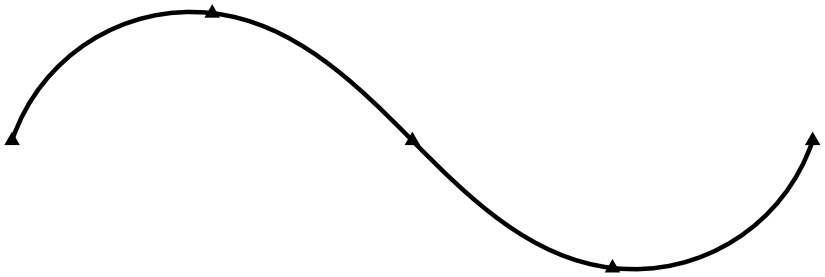
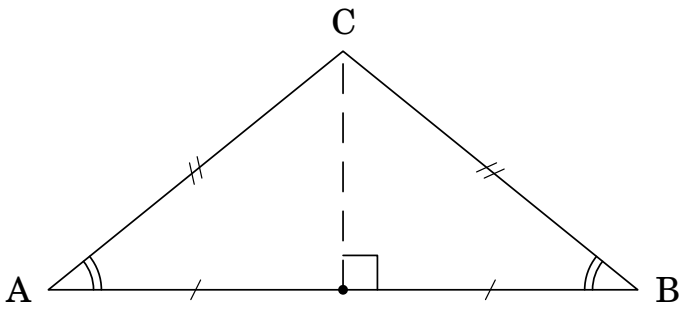


Figure 1. Figure generated using folded Asymptote code

Eukleides. An environment for generation of geometrical figures

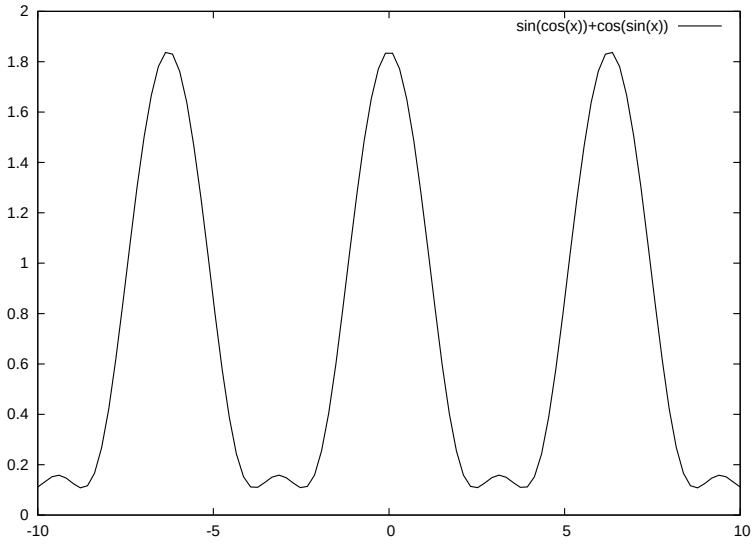
```
Eukleides] box -1, -1, 7, 3

           A B C isosceles
           H = projection(C, line(A, B))

           draw
            (A.B.C)
             C.H dashed
             H
           end

           label
             A 180:
             B 0:
             C 90:
             B, H, C right
             B, A, C double
             C, B, A double
             A.H
             B.H
             A.C double
             C.B double
           end
```




```
Eukleides]
```

Gnuplot. Gnuplot is graphics application

```
GNUplot] plot sin(cos(x))+cos(sin(x))
```




```
GNUplot]
```

Lisp.

```
   ;; Loading file /opt/TeXmacs/plugins/lisp/clisp/clisp-init.lisp ...
   ;;  Loading file lisp/tmlib.lisp ...
   ;;  Loaded file lisp/tmlib.lisp
   ;; Loaded file /opt/TeXmacs/plugins/lisp/clisp/clisp-init.lisp
CLisp> (car '(a b c))

   A
CLisp> (cdr '(a b c))

   (B C)
CLisp>
```

Mathematica.

```
Mathematica
In[1]:= N[Pi,1000]
```

3.14159265358979323846264338327950288419716939937510582097494459230781640628620899862\
80348253421170679821480865132823066470938446095505822317253594081284811174502841027019\
38521105559644622948954930381964428810975665933446128475648233786783165271201909145648\
56692346034861045432664821339360726024914127372458700660631558817488152092096282925409\
09171536436789259036001133053054882046652138414695194151160943305727036575959195309218\
61173819326117931051185480744623799627495673518857527248912279381830119491298336733624\
40656643086021394946395224737190702179860943702770539217176293176752384674818467669405\
13200056812714526356082778577134275778960917363717872146844090122495343014654958537105\
07922796892589235420199561121290219608640344181598136297747713099605187072113499999837\
29780499510597317328160963185950244594553469083026425223082533446850352619311881710100\
03137838752886587533208381420617177669147303598253490428755468731159562863882353787593\
75195778185778053217122680661300192787661119590921642019953

In[2]:= 100!

933262154439441526816992388562667004907159682643816214685929638952175999932299156089414\
639761565182862536979208272237582511852109168640000000000000000000000000

In[4]:= D[Sin[Cos[x]]+Cos[Sin[x]],{x,10}]

$$945\sin^5(x)\sin(\sin(x))-2205\sin^3(x)\sin(\sin(x))+\sin(x)\sin(\sin(x))-945\cos(\cos(x))\cos^5(x)+$$
$$2205\cos(\cos(x))\cos^3(x)-\cos(\cos(x))\cos(x)+\cos^{10}(x)(-\cos(\sin(x)))-120\cos^8(x)\cos(\sin(x))+$$
$$45\sin(x)\sin(\sin(x))\cos^8(x)+630\sin^2(x)\cos^6(x)\cos(\sin(x))-2352\cos^6(x)\cos(\sin(x))+$$
$$2730\sin(x)\sin(\sin(x))\cos^6(x)-3150\sin^3(x)\sin(\sin(x))\cos^4(x)+$$
$$15750\sin^2(x)\cos^4(x)\cos(\sin(x))-4725\sin^2(x)\cos^4(x)\sin(\cos(x))-5440\cos^4(x)\cos(\sin(x))-$$
$$3150\cos^4(x)\sin(\cos(x))+19530\sin(x)\sin(\sin(x))\cos^4(x)+3150\sin^4(x)\cos(\cos(x))\cos^3(x)+$$
$$22050\sin^2(x)\cos(\cos(x))\cos^3(x)+630\sin^6(x)\cos^2(x)\sin(\cos(x))-$$
$$4725\sin^4(x)\cos^2(x)\cos(\sin(x))+15750\sin^4(x)\cos^2(x)\sin(\cos(x))-$$
$$22050\sin^3(x)\sin(\sin(x))\cos^2(x)+25515\sin^2(x)\cos^2(x)\cos(\sin(x))+$$
$$25515\sin^2(x)\cos^2(x)\sin(\cos(x))-256\cos^2(x)\cos(\sin(x))+255\cos^2(x)\sin(\cos(x))+$$
$$7125\sin(x)\sin(\sin(x))\cos^2(x)-\sin^{10}(x)\sin(\cos(x))-45\sin^8(x)\cos(\cos(x))\cos(x)-$$
$$120\sin^8(x)\sin(\cos(x))-2730\sin^6(x)\cos(\cos(x))\cos(x)-2352\sin^6(x)\sin(\cos(x))-$$
$$19530\sin^4(x)\cos(\cos(x))\cos(x)-3150\sin^4(x)\cos(\sin(x))-5440\sin^4(x)\sin(\cos(x))-$$
$$7125\sin^2(x)\cos(\cos(x))\cos(x)+255\sin^2(x)\cos(\sin(x))-256\sin^2(x)\sin(\cos(x))$$

In[5]:= 1 == 2

False

In[6]:= 1 == 1

True

In[7]:= Eq = x==1

$x=1$

In[8]:= Eq /. x->1

True

In[9]:= ODE = y'[x] + x y[x] == Sin[x]

$y'(x)+xy(x)=\sin(x)$

In[14]:= sol = DSolve[ODE,y[x],x]

$$\left\{\left\{y(x)\to c_1 e^{-\frac{x^2}{2}}-\frac{1}{2}i\sqrt{\frac{\pi}{2}}e^{\frac{1}{2}-\frac{x^2}{2}}\left(\text{erfi}\left(\frac{x+i}{\sqrt{2}}\right)-\text{erfi}\left(\overline{x-i}\,\sqrt{2}\right)\right)\right\}\right\}$$

In[17]:= z[x_] = y[x] /. sol[[1,1]]

$$c_1 e^{-\frac{x^2}{2}}-\frac{1}{2}i\sqrt{\frac{\pi}{2}}e^{\frac{1}{2}-\frac{x^2}{2}}\left(\text{erfi}\left(\frac{x+i}{\sqrt{2}}\right)-\text{erfi}\left(\overline{x-i}\,\sqrt{2}\right)\right)$$

In[15]:= sol[[1,1]]

$$y(x)\to c_1 e^{-\frac{x^2}{2}}-\frac{1}{2}i\sqrt{\frac{\pi}{2}}e^{\frac{1}{2}-\frac{x^2}{2}}\left(\text{erfi}\left(\frac{x+i}{\sqrt{2}}\right)-\text{erfi}\left(\overline{x-i}\,\sqrt{2}\right)\right)$$

In[18]:= z[1.]

$0.606531\,c_1+(1.21479+0.i)$

In[19]:=

Maxima.

```
(%i1) diff(sin(x),x);
```

(%o1) $\cos(x)$

```
(%i2)
```

Octave.

.

$$A = \begin{pmatrix} 0.45229 & 0.22986 & 0.70938 \\ 0.65207 & 0.84622 & 0.8479 \\ 0.28058 & 0.5938 & 0.36148 \end{pmatrix}, A^{-1} = \begin{pmatrix} -11.373 & 19.462 & -23.333 \\ 0.12663 & -2.0461 & 4.5509 \\ 8.6198 & -11.746 & 13.402 \end{pmatrix}$$

```
octave> A=rand(3)
```

$$\begin{pmatrix} 0.93125 & 0.050603 & 0.82831 \\ 0.22199 & 0.11851 & 0.75259 \\ 0.09635 & 0.24193 & 0.66373 \end{pmatrix}$$

```
octave> inv(A)
```

$$\begin{pmatrix} 1.5894 & -2.5636 & 0.9233 \\ 1.15 & -8.273 & 7.9454 \\ -0.6499 & 3.3876 & -1.5235 \end{pmatrix}$$

```
octave>
```

Python.

```
Python] from pylab import *
Python] x=arange(0.,3.15,0.01); y=sin(x); plot(x,y);
Python] show()
    None
Python]
```

Shell.

```
   Shell session inside TeXmacs pid = 26400
Shell] pwd
   /home/student
Shell] ls
   bearclaw  documents  ecss0.log   mitran-web  research  Wolfram Mathematica
   courses   Downloads  fontconfig  perl5       TeXmacs
   Desktop   ecbx0.log  mitran      projects    tmp
Shell]
```