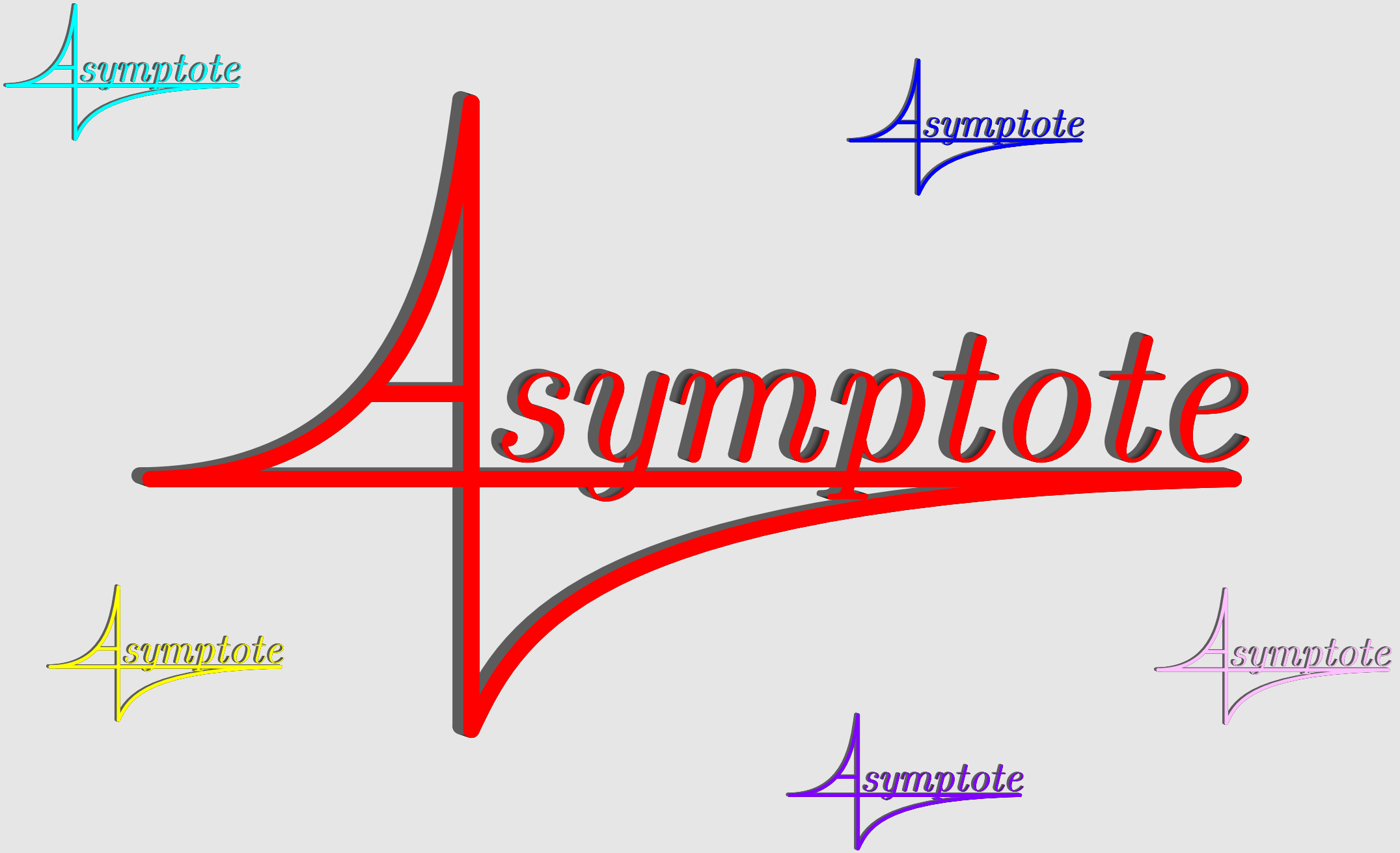
Asymptote
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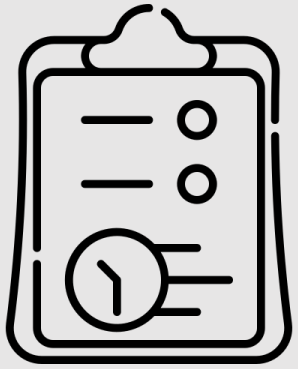
Asymptote

Semana IF 2023

# Introducción a Asymptote

**The Vector Graphics Language**

Prof. Gerardo Lacy Mora
glacy@itcr.ac.cr



- ¿Qué es Asymptote ?
- Ambiente de trabajo (workspace)
- Ejemplos
- Asymptote en Overleaf

# Asymptote

es un poderoso **lenguaje descriptivo de gráficos vectoriales** que provee un marco de referencia matemático basado en coordenadas para realizar dibujos técnicos.

Ecuaciones y etiquetas mediante LaTeX

Por defecto, produce salidas PostScript, pero también genera gráficos vectoriales en formato OpenGL, PDF, SVG, WebGL, V3D y PRCD; así como cualquier formato que el paquete ImageMagick pueda producir.


https://asymptote.sourceforge.io/


# Asymptote: The Vector Graphics Language

SOURCEFORGE

Asymptote is a powerful descriptive vector graphics language that provides a natural coordinate-based framework for technical drawing. Labels and equations are typeset with LaTeX, the de-facto standard for typesetting mathematics.

A major advantage of Asymptote over other graphics packages is that it is a programming language, as opposed to just a graphics program.

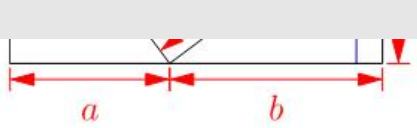
You can even run it in your browser without installing it, using the Asymptote Web Application. Just enter the code

**import workcone;**

(including the semicolon) and click the Run button.

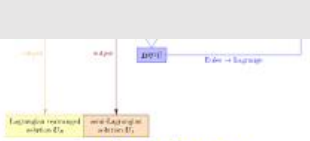
Features of Asymptote:

- provides a portable standard for typesetting mathematical figures, just as TeX/LaTeX has become the standard for typesetting equations;
- generates high-quality PostScript, OpenGL, PDF, SVG, WebGL, V3D, and PRC vector graphics;
- embeds 3D vector WebGL graphics within HTML files;




Pythagoras.asy

axialshade.asy



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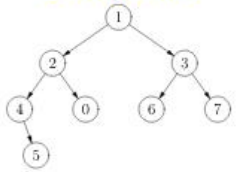


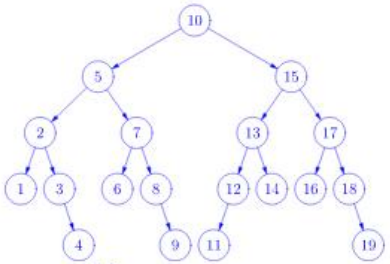


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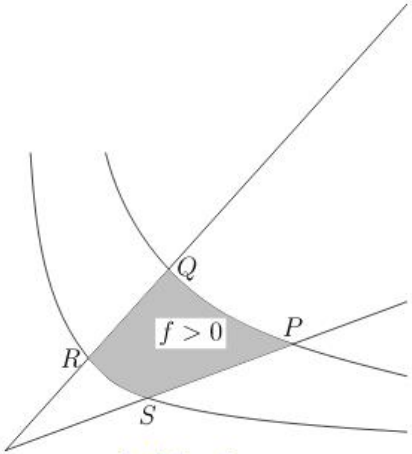


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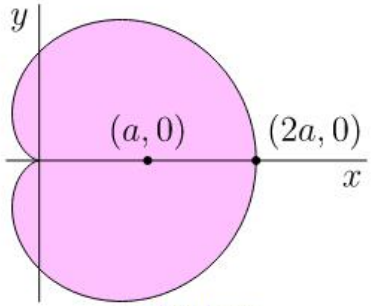


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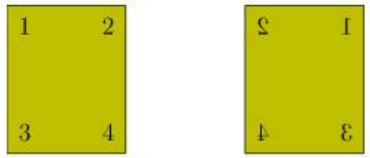




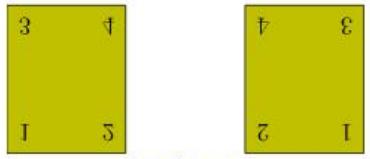


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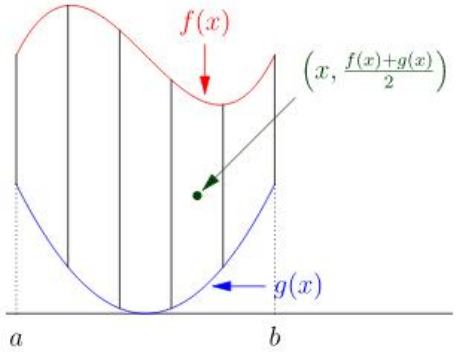


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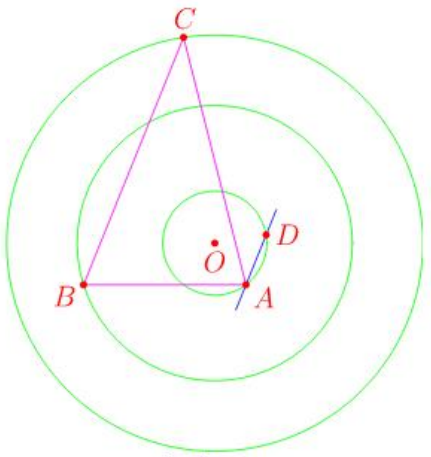


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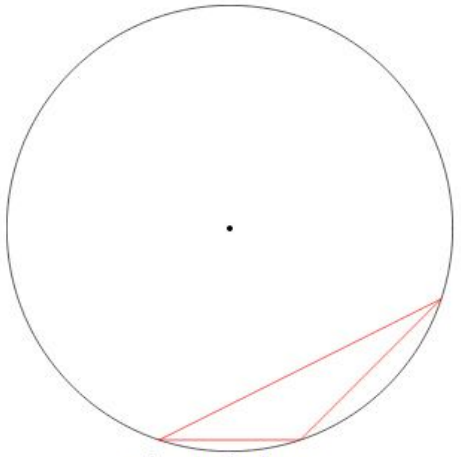

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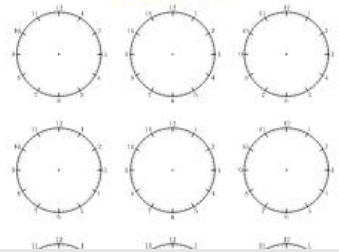

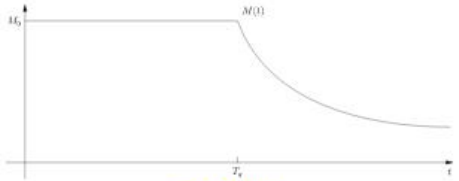


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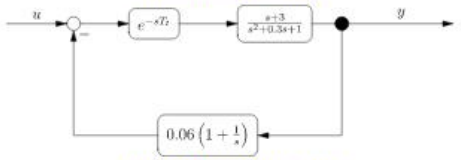


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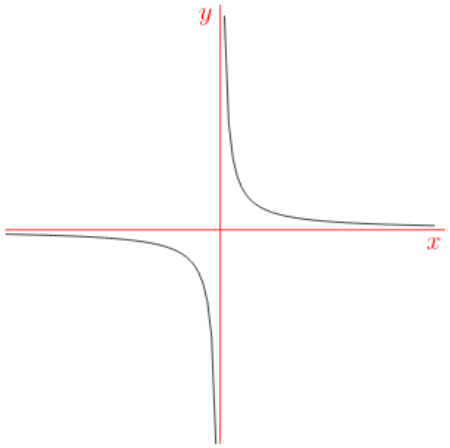
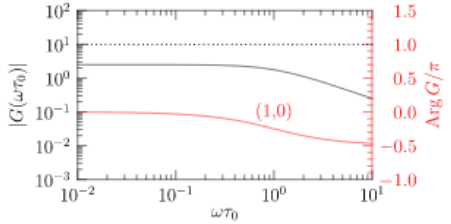



1overx.asy

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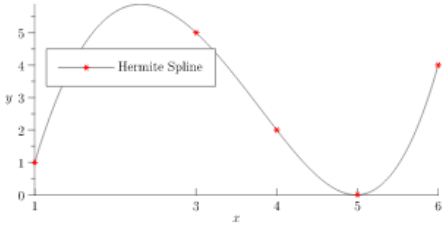


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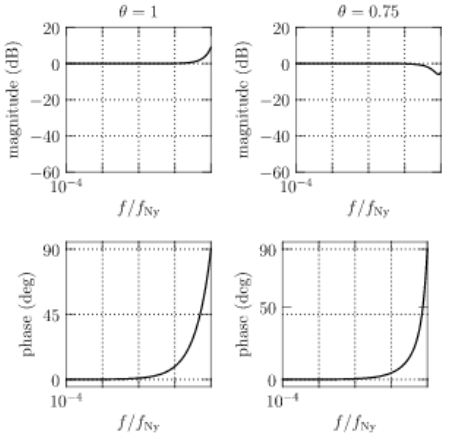


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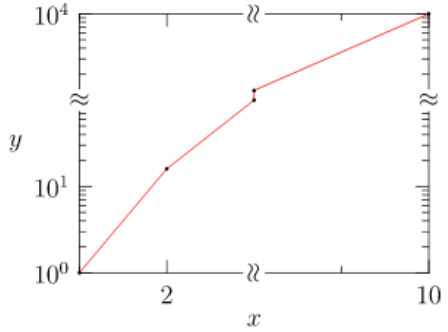


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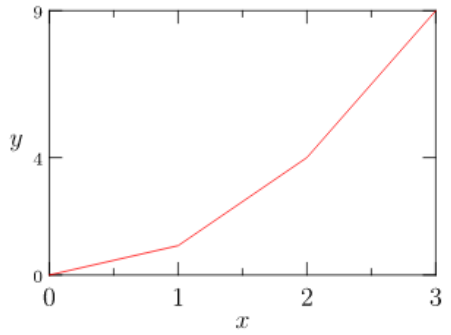


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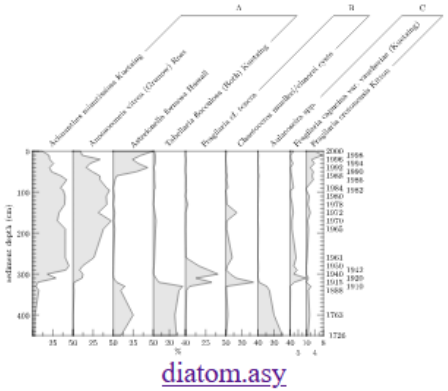

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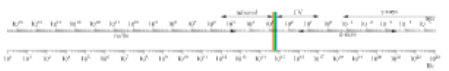
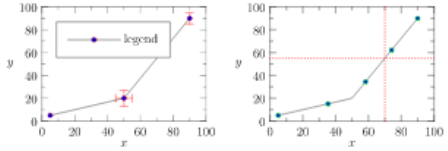


electromagnetic.asy

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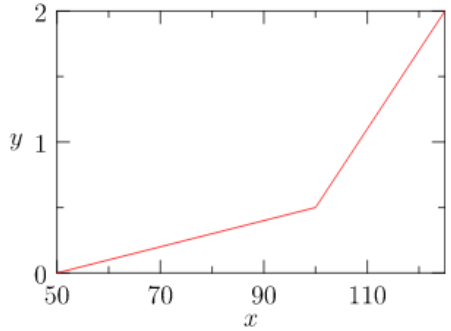


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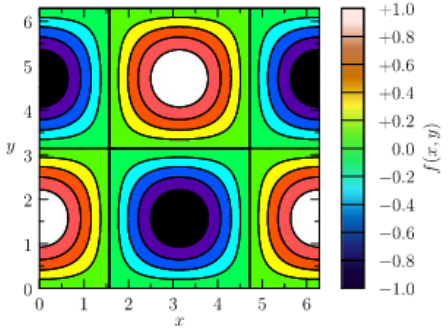


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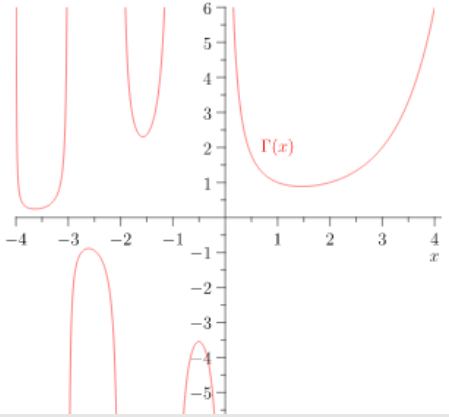

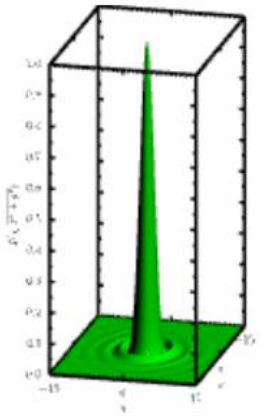

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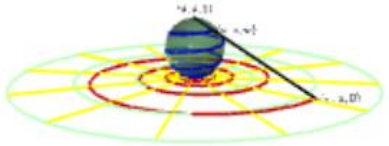
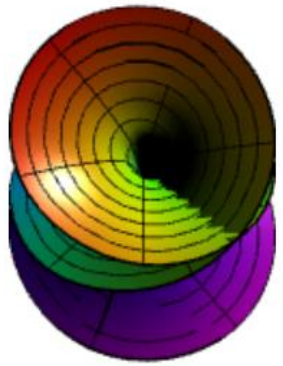


RiemannSphere.asy

RiemannSurface.asy



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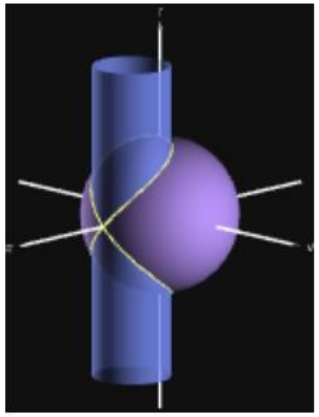
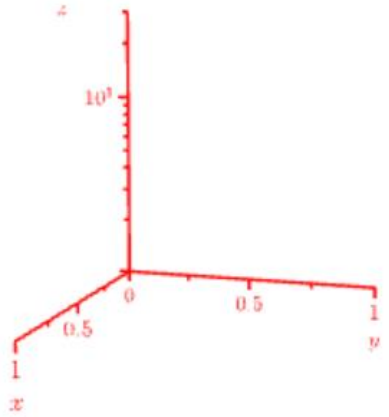
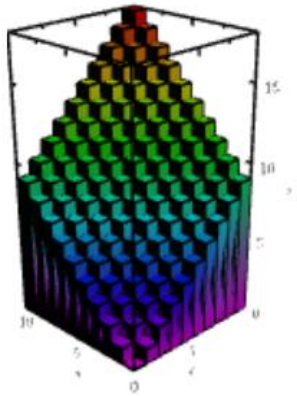


Viviani.asy




axis3.asy



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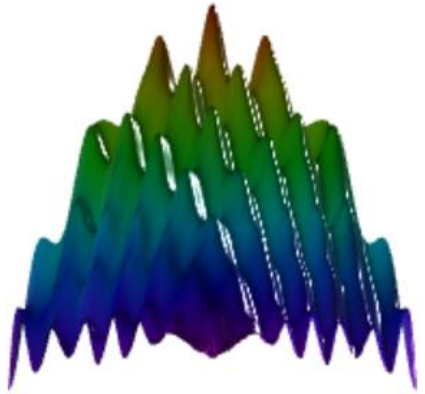

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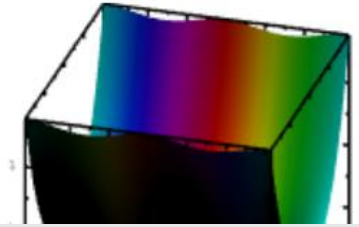
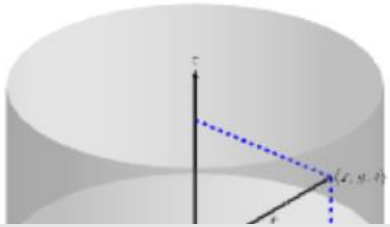
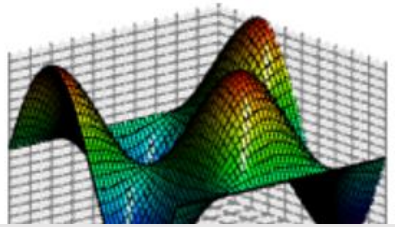
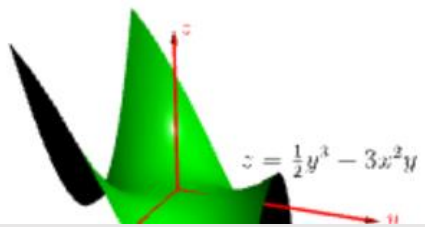
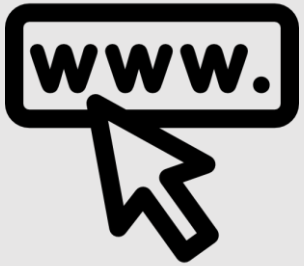


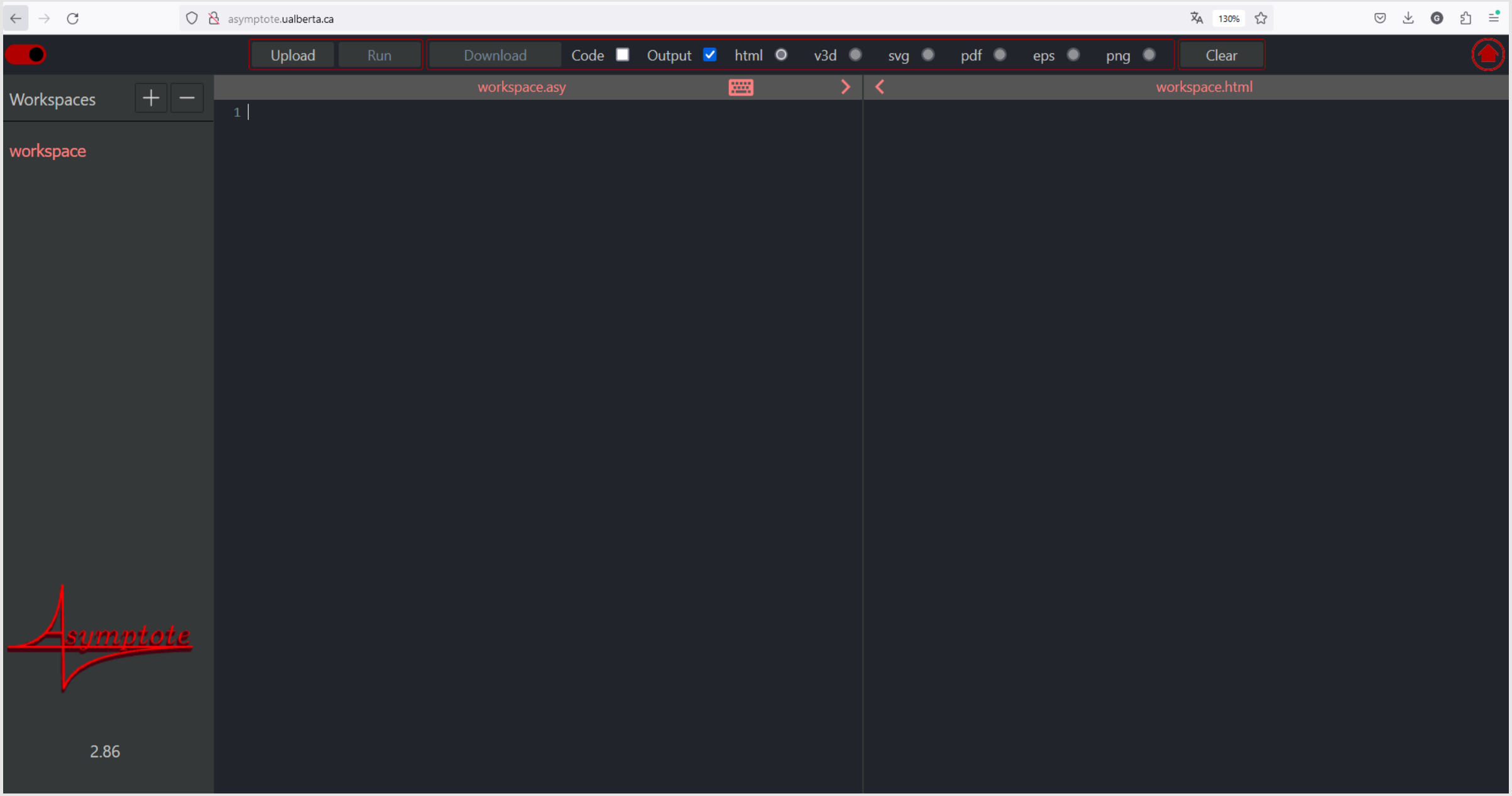









http://asymptote.ualberta.ca/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svg
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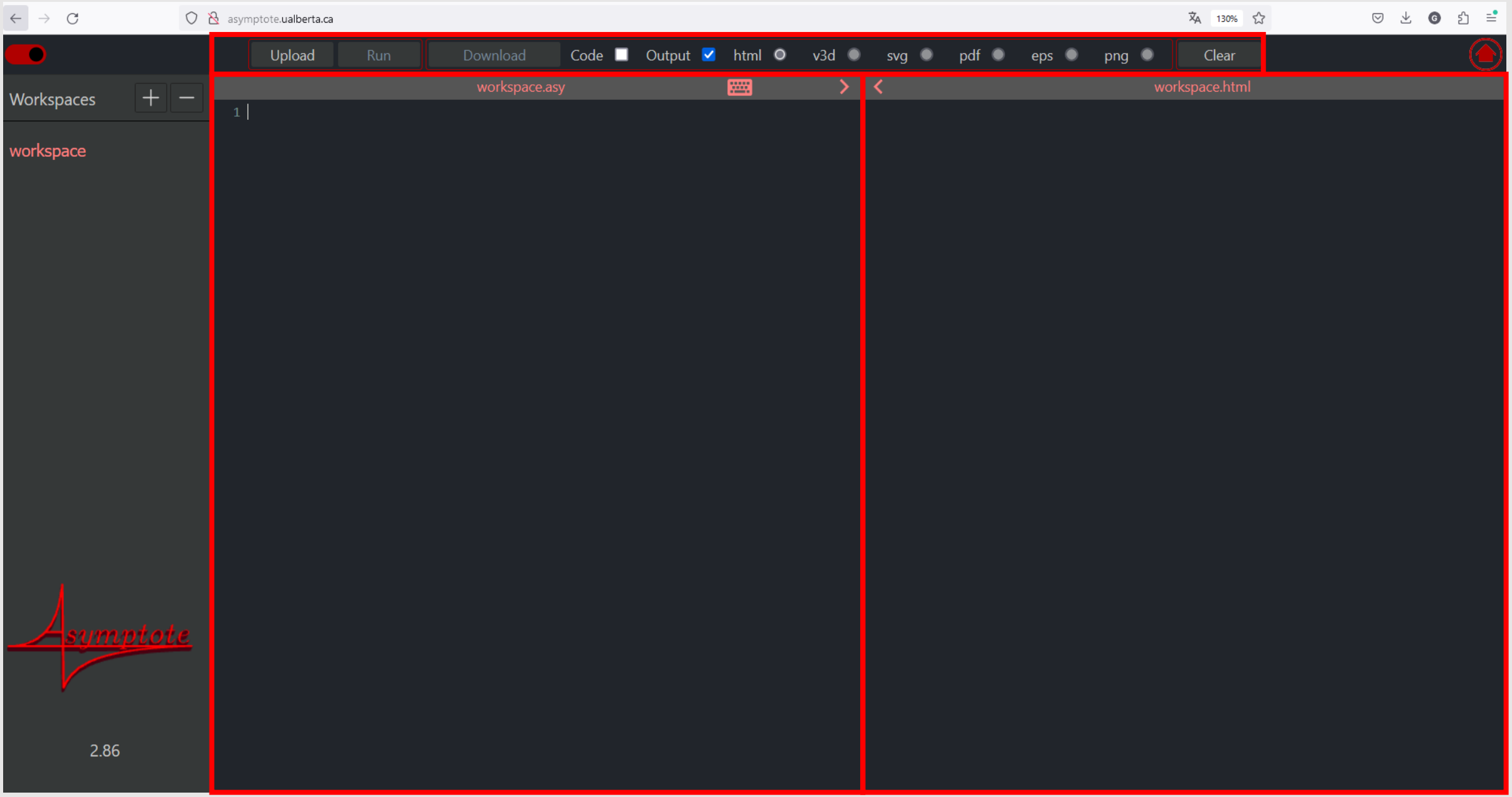
workspace.html
Asymptote
2.86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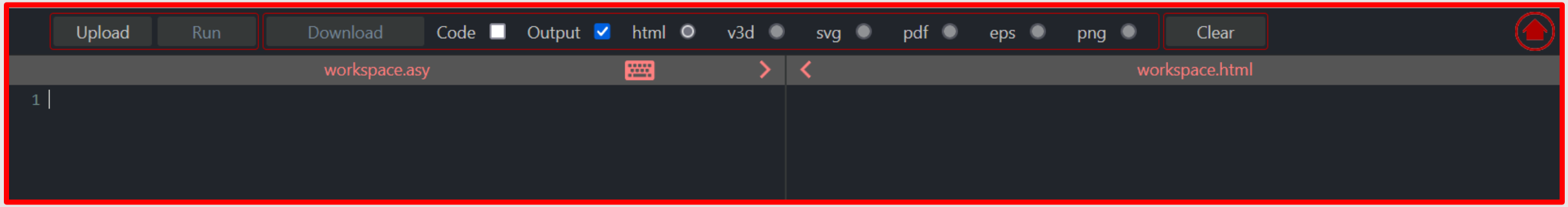
2.86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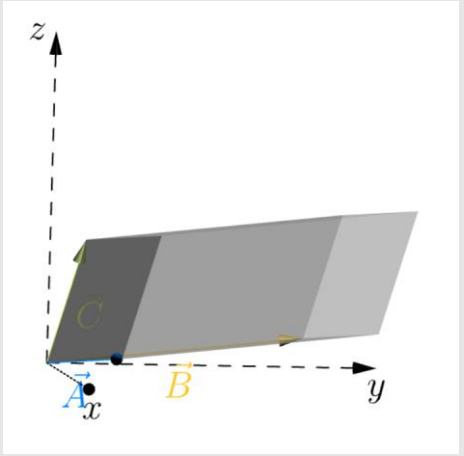
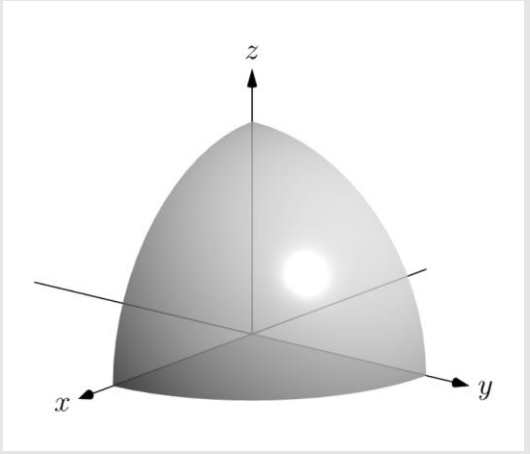
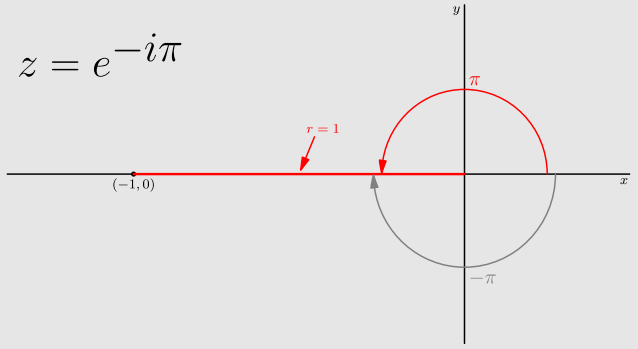
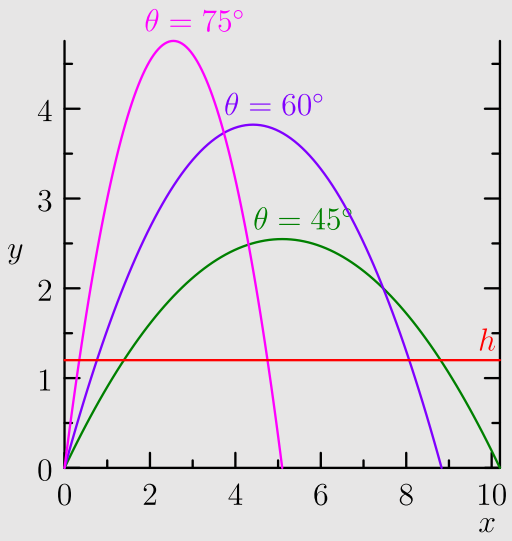
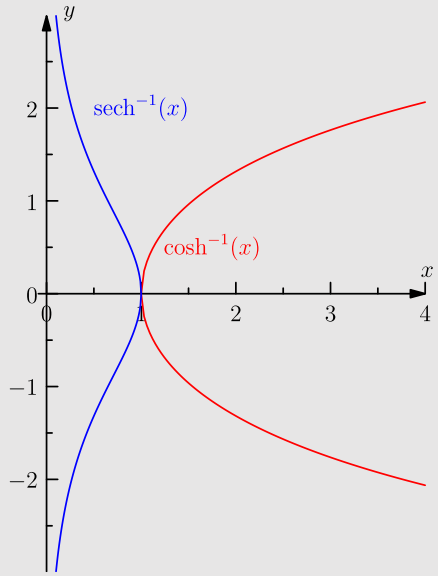
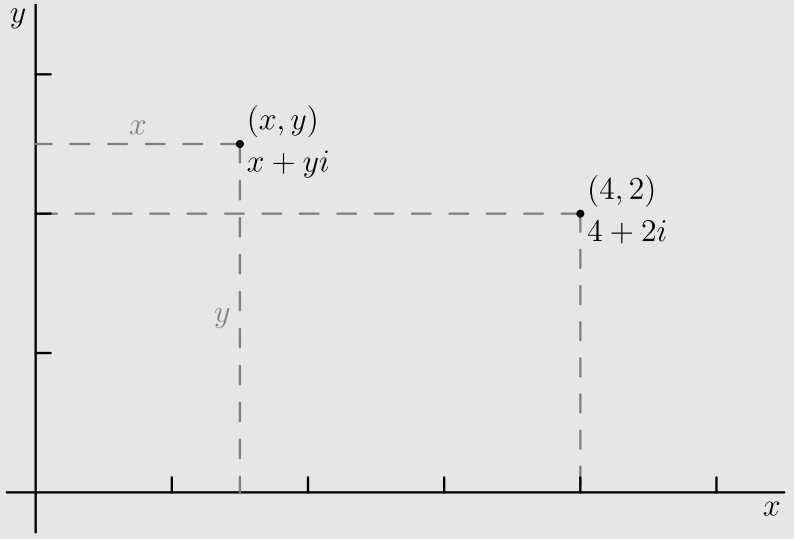

z
C
B
A
x
y


z
x
y


$z = e^{-i\pi}$
y
π
r = 1
(−1, 0)
x
−π


θ = 75°
θ = 60°
θ = 45°
h
y
x
0
1
2
3
4
0
2
4
6
8
10


y
sech⁻¹(x)
cosh⁻¹(x)
x
2
1
0
−1
−2
0
1
2
3
4


y
x
(x, y)
x + yi
(4, 2)
4 + 2i
y
x

workspace.asy

```
import three;
import graph3;
//import math;
currentprojection=orthographic(5,4,2,center=true);

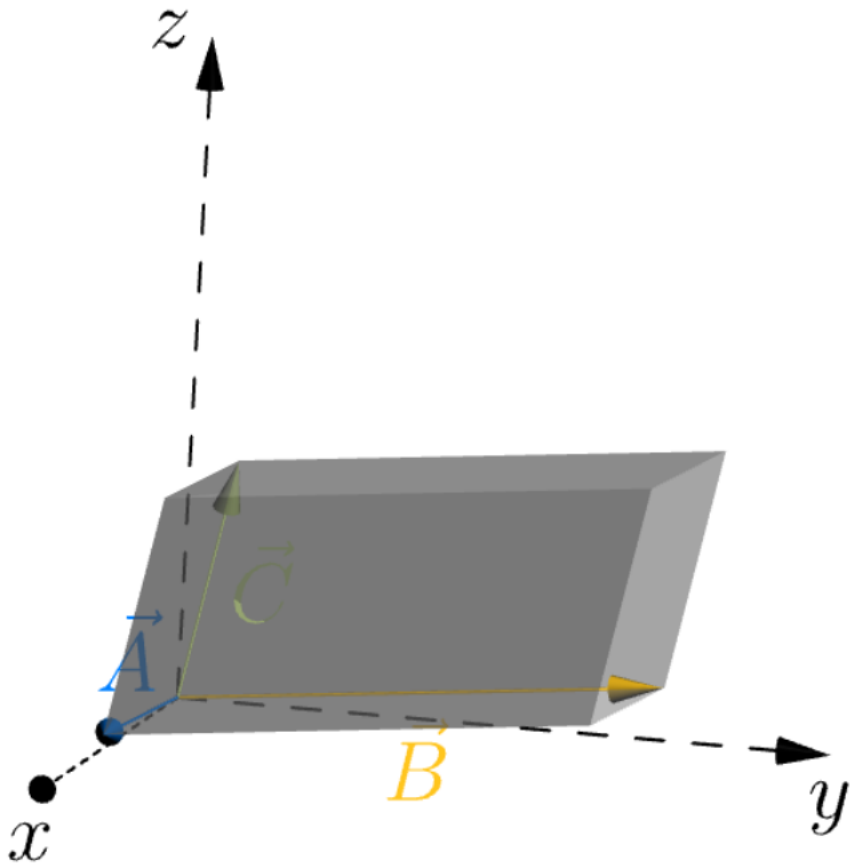
size(5cm);
size3(5cm,5cm,5cm);
//componentes de A
real ax=5;
real ay=0.5;
real az=0.5;
//componentes de B
real bx=0.5;
real by=4;
real bz=0.5;
//componentes de C
real cx=0.5;
real cy=0.5;
real cz=2;

//ejes +etiquetas
xaxis3(Label("$x$",1),xmax=5.25,dashed,Arrow3);
yaxis3(Label("$y$",1),ymax=5.25,dashed,Arrow3);
zaxis3(Label("$z$",1),zmax=5.25,dashed,Arrow3);

//dibajar vectores A, B y C
draw("$\vec{A}$",(0,0,0)--(ax,ay,az),rgb(00,28,56),Arrow3,PenMargin3);
draw("$\vec{B}$",(0,0,0)--(bx,by,bz),rgb(212,164,24),Arrow3,PenMargin3);
draw("$\vec{C}$",(0,0,0)--(cx,cy,cz),rgb(159,180,105),Arrow3,PenMargin3);

//dibujar las caras del paralelepípedo
pen bg=gray(0.9)+opacity(0.5);
draw(surface((ax,ay,az)--(ax+bx,ay+by,az+bz)--(bx,by,bz)--(0,0,0)--cycle),bg);
draw(surface((ax,ay,az)--(ax+cx,ay+cy,az+cz)--(cx,cy,cz)--(0,0,0)--cycle),bg);
draw(surface((bx,by,bz)--(bx+cx,by+cy,bz+cz)--(cx,cy,cz)--(0,0,0)--cycle),bg);
draw(surface((ax+cx,ay+cy,az+cz)--(ax+bx+cx,ay+by+cy,az+bz+cz)--(ax+bx,ay+by,az+bz)--(ax,ay,az)--
cycle),bg);
draw(surface((ax+cx,ay+cy,az+cz)--(ax+bx+cx,ay+by+cy,az+bz+cz)--(cx+bx,cy+by,cz+bz)--(cx,cy,cz)--
cycle),bg);
```

workspace.html



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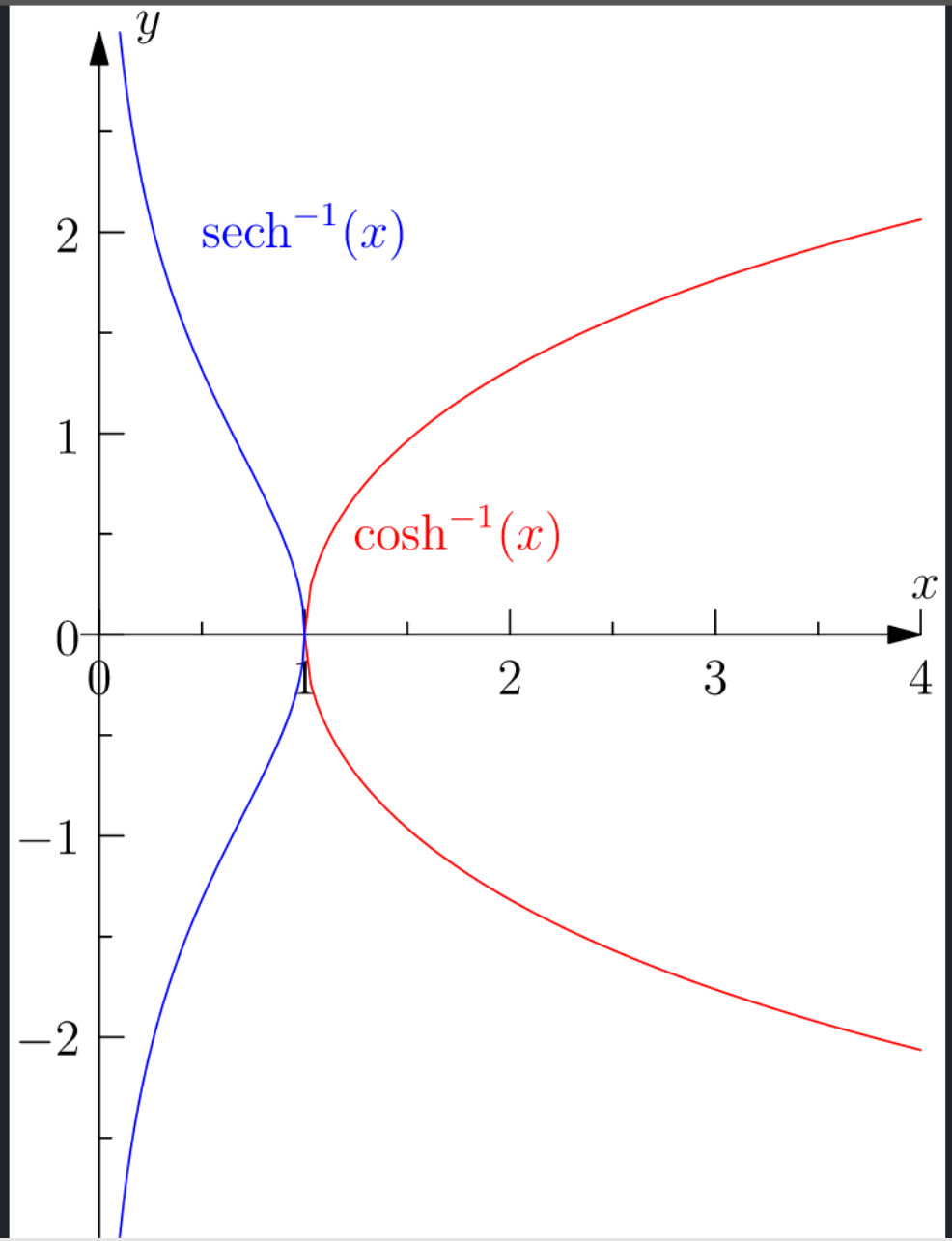
workspace.asy

```
import graph;

size(0,4inches,IgnoreAspect);

real lne(real x) {static real lne=log(exp(1)); return log(x)/lne;};
real f1(real x) {return acosh(x);}
real f2(real x) {return -acosh(x);}
real f3(real x) {return lne((1+sqrt(1-x^2))/(x));}
real f4(real x) {return -1*lne((1+sqrt(1-x^2))/(x));}
xaxis(Label("$x$",position=EndPoint, align=NE),LeftTicks,Arrow);
yaxis(Label("$y$",position=EndPoint, align=NE),RightTicks,Arrow);
label("$\cosh^{-1} (x)$",(1.75,.5),fontsize(12pt)+red);
label("$\mbox{sech}^{-1} (x)$",(1,2),fontsize(12pt)+blue);
draw(graph(f1,1,4),red);
draw(graph(f2,1,4),red);
draw(graph(f3,0.1,1),blue);
draw(graph(f4,0.1,1),blue);
```

workspace.html



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workspace.asy

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yaxis(Label("$y$",position=EndPoint, align=NE),RightTicks,Arrow);
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draw(graph(f2,1,4),red);
draw(graph(f3,0.1,1),blue);
draw(graph(f4,0.1,1),blue);
```

workspace.asy

```
import graph;
import math;
size(300,200,IgnoreAspect);

real xmin=0,xmax=20;
real ymin=0,ymax=10;

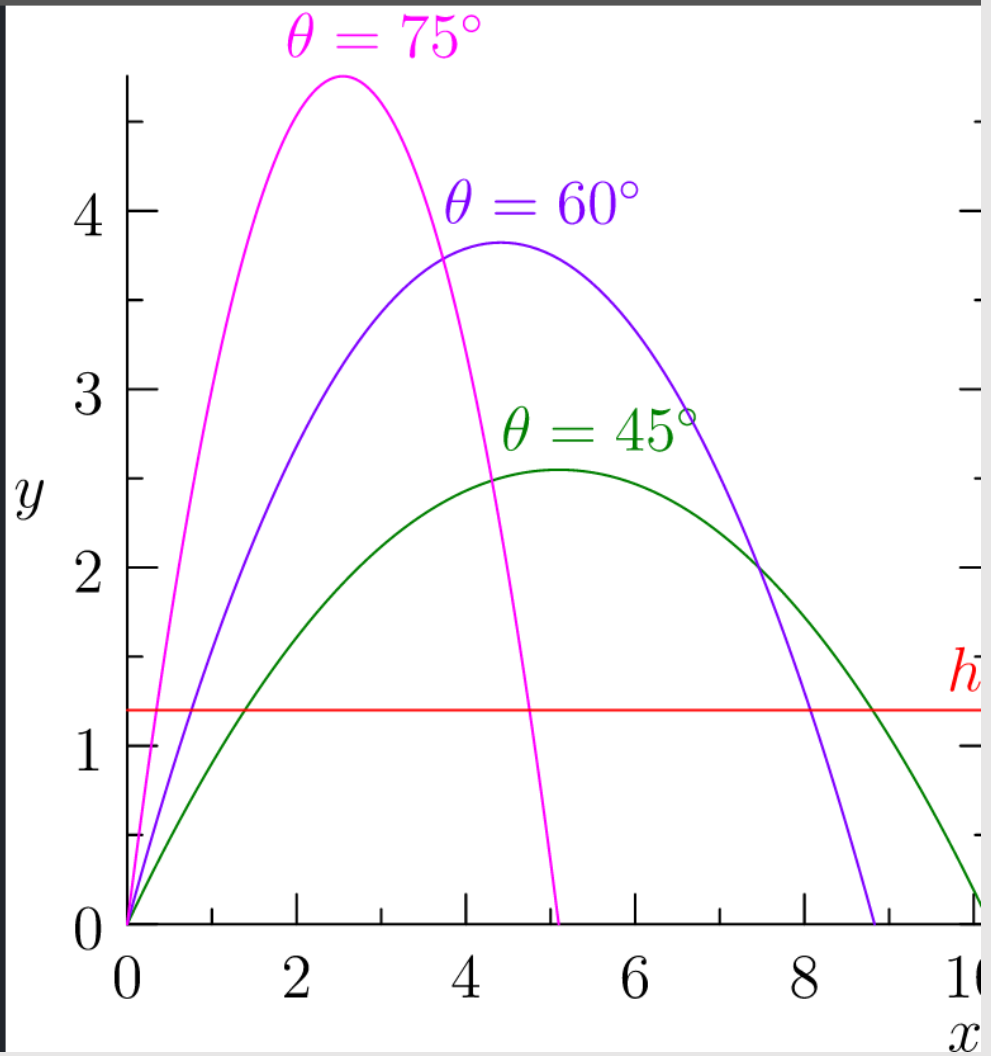
typedef real realfcn(real);
realfcn F(real v,real a) {
  return new real(real x) {return (-4.905*x^2)/(v*cos(a))^2+x*tan(a);};
}

real H(real v, real a) {return v^2*(sin(a))^2/(2*9.81);}
real R(real v, real a) {return v^2*sin(2*a)/(9.81);}

typedef real realfcn(real);
real v=10;
for(int i=45; i < 90; i=i+15){
  draw(graph(F(v,i*pi/180),0,R(v,i*pi/180)),Pen(i),
       "$\theta="+(i == 1 ? "" : (string) i)+"^{\circ}$");
  label("$\theta="+(i == 1 ? "" : (string) i)+"^{\circ}$",(R(v,i*pi/
180)/2+.5,H(v,i*pi/180)),N,Pen(i));
      }

xaxis("$x$",xmax=R(v,45*pi/180),LeftTicks);
yaxis("$y$",ymin=0,LeftRight,RightTicks(trailingzero));
yequals(Label("$h$",(8,1.2),up),1.2,extend=false,red);
//attach(legend(2),(point(S).x,truepoint(S).y),10S,UnFill);
```

workspace.html



workspace.asy

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180)/2+.5,H(v,i*pi/180)),N,Pen(i));
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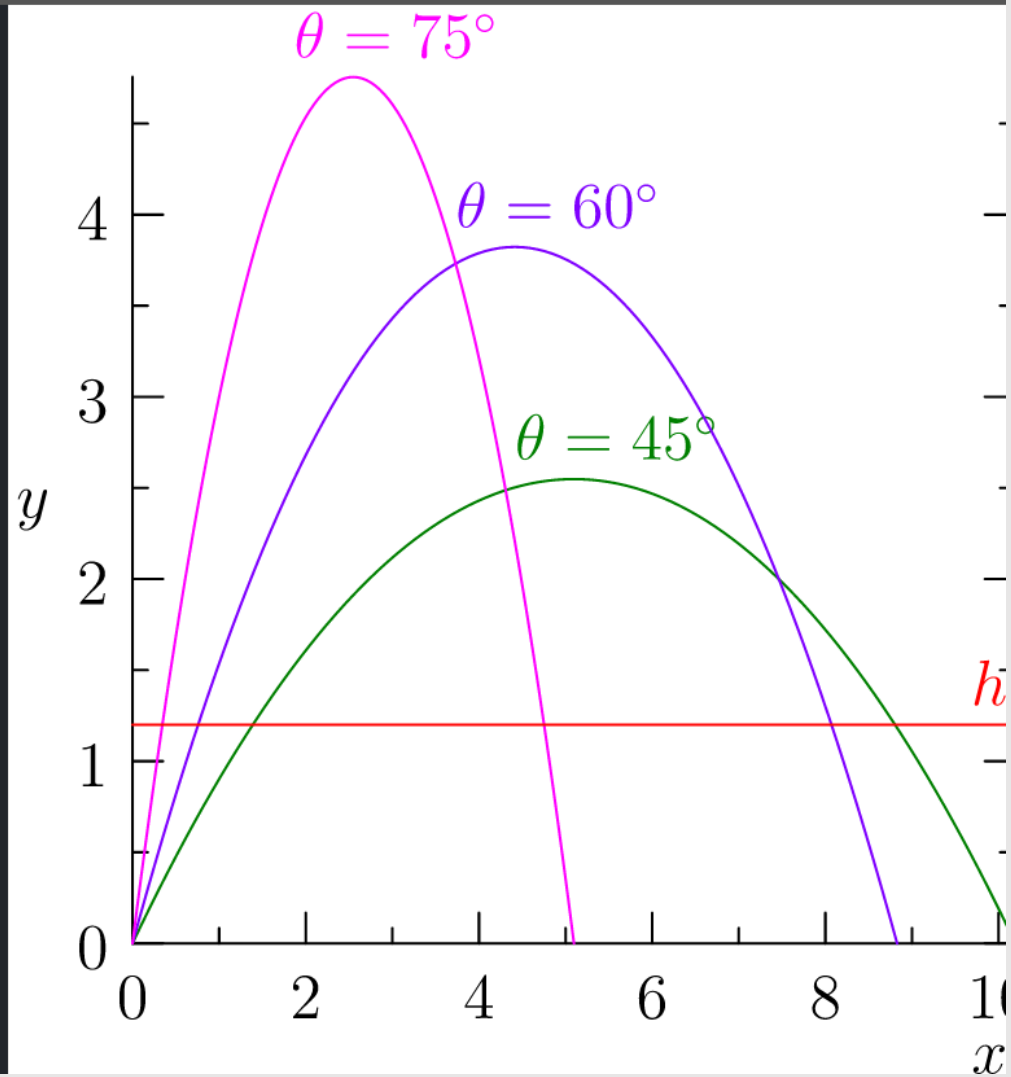
workspace.html



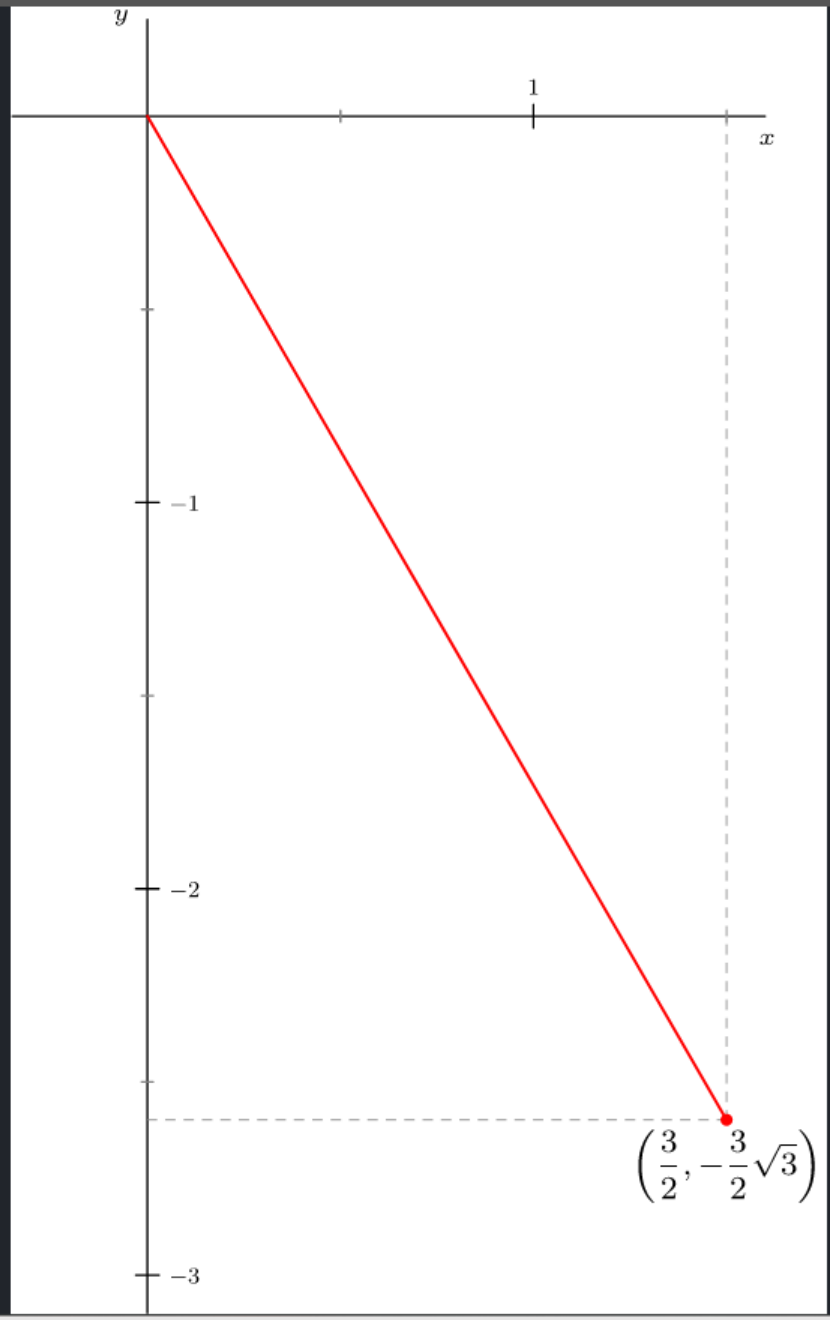
workspace.asy

```
size(200,0,IgnoreAspect);
import graph;
import math;
pair z0=(0,0);
pair z1=(1.5,-1.5*sqrt(3));
real xmax,xmin,ymax,ymin;
if(z1.x > 0) {
xmax=z1.x+.1;
xmin=-.35;
} else {
xmax=.25;
xmin=z1.x-.1;
}
if(z1.y > 0) {
ymax=z1.y+.1;
ymin=-.25;
} else {
ymax=.25;
ymin=z1.y-.5;
}
real theta=atan(z1.y/z1.x);
draw(z0--z1,.25mm+red);
draw(z1--(z1.x,0),.1mm+dashed+gray);
draw(z1--(0,z1.y),.1mm+dashed+gray);
dot(z1,red);
xaxis(Label("$x$",position=EndPoint,
align=SE,fontsize(6pt)),xmin=xmin,xmax=xmax,fontsize(8pt),Ticks(scale(.
7)*Label(align=W),NoZero,begin=true,beginlabel=true,            end=true,endlabel=true,Step=1,step=.5,
Size=1mm, size=.5mm,pTick=black,ptick=gray));
yaxis(Label("$y$",fontsize(6pt),position=EndPoint, align=NW),ymin=ymin,ymax=ymax,fontsize(8pt),
 Ticks(scale(.7)*Label(align=E),NoZero,begin=true,beginlabel=true,end=true,endlabel=true,Step=1,step=.5,
Size=1mm,size=.5mm,pTick=black,ptick=gray));
label("$\displaystyle\left( \frac{3}{2},-\frac{3}{2}\sqrt{3}\right)$",z1,5,fontsize(8pt));

write(abs(z1));
write(degrees(theta));
```

```
3
-60
```

workspace.html



workspace.asy

```
size(200,0,IgnoreAspect);
import graph;
import math;
pair z0=(0,0);
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real xmax,xmin,ymax,ymin;
if(z1.x > 0) {
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xmin=-.35;
} else {
xmax=.25;
xmin=z1.x-.1;
}
if(z1.y > 0) {
ymax=z1.y+.1;
ymin=-.25;
} else {
ymax=.25;
ymin=z1.y-.5;
}
real theta=atan(z1.y/z1.x);
draw(z0--z1,.25mm+red);
draw(z1--(z1.x,0),.1mm+dashed+gray);
draw(z1--(0,z1.y),.1mm+dashed+gray);
dot(z1,red);
xaxis(Label("$x$",position=EndPoint,
align=SE,fontsize(6pt)),xmin=xmin,xmax=xmax,fontsize(8pt),Ticks(scale(.
7)*Label(align=W),NoZero,begin=true,beginlabel=true,              end=true,endlabel=true,Step=1,step=.5,
Size=1mm, size=.5mm,pTick=black,ptick=gray));
yaxis(Label("$y$",fontsize(6pt),position=EndPoint, align=NW),ymin=ymin,ymax=ymax,fontsize(8pt),
 Ticks(scale(.7)*Label(align=E),NoZero,begin=true,beginlabel=true,end=true,endlabel=true,Step=1,step=.5,
Size=1mm,size=.5mm,pTick=black,ptick=gray));
label("$\displaystyle\left( \frac{3}{2},-\frac{3}{2}\sqrt{3}\right)$",z1,S,fontsize(8pt));

write(abs(z1));
write(degrees(theta));
```

workspace.asy

```
size(200,0,IgnoreAspect);
import graph;
import math;
pair z0=(0,0);
pair z1=(1.5,-1.5*sqrt(3));
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xmax=.25;
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ymin=-.25;
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ymax=.25;
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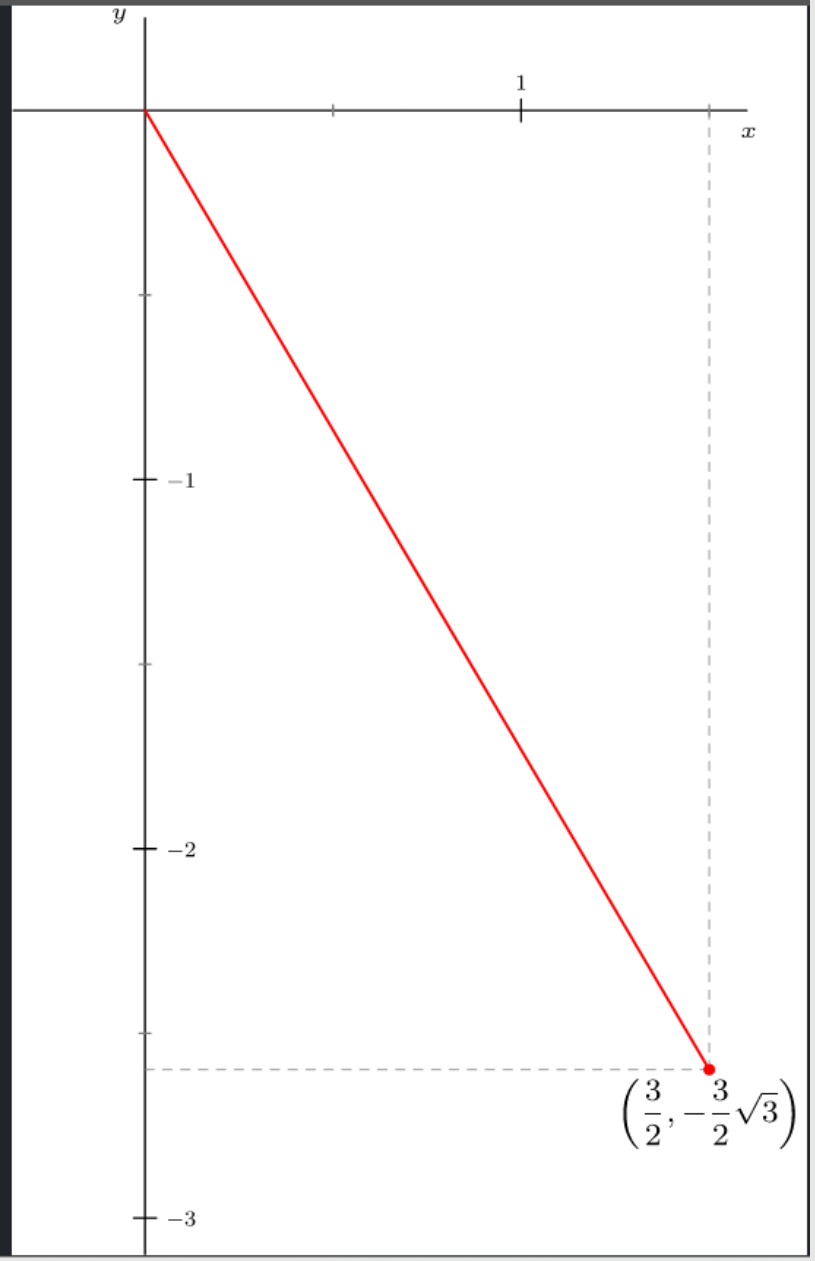
draw(z1--(z1.x,0),.1mm+dashed+gray);
draw(z1--(0,z1.y),.1mm+dashed+gray);
dot(z1,red);
xaxis(Label("$x$",position=EndPoint,
align=SE,fontsize(6pt)),xmin=xmin,xmax=xmax,fontsize(8pt),Ticks(scale(.
7)*Label(align=W),NoZero,begin=true,beginlabel=true,            end=true,endlabel=true,Step=1,step=.5,
Size=1mm, size=.5mm,pTick=black,ptick=gray));
yaxis(Label("$y$",fontsize(6pt),position=EndPoint, align=NW),ymin=ymin,ymax=ymax,fontsize(8pt),
 Ticks(scale(.7)*Label(align=E),NoZero,begin=true,beginlabel=true,end=true,endlabel=true,Step=1,step=.5,
Size=1mm,size=.5mm,pTick=black,ptick=gray));
label("$\displaystyle\left( \frac{3}{2},-\frac{3}{2}\sqrt{3}\right)$",z1,S,fontsize(8pt));

write(abs(z1));
write(degrees(theta));
```

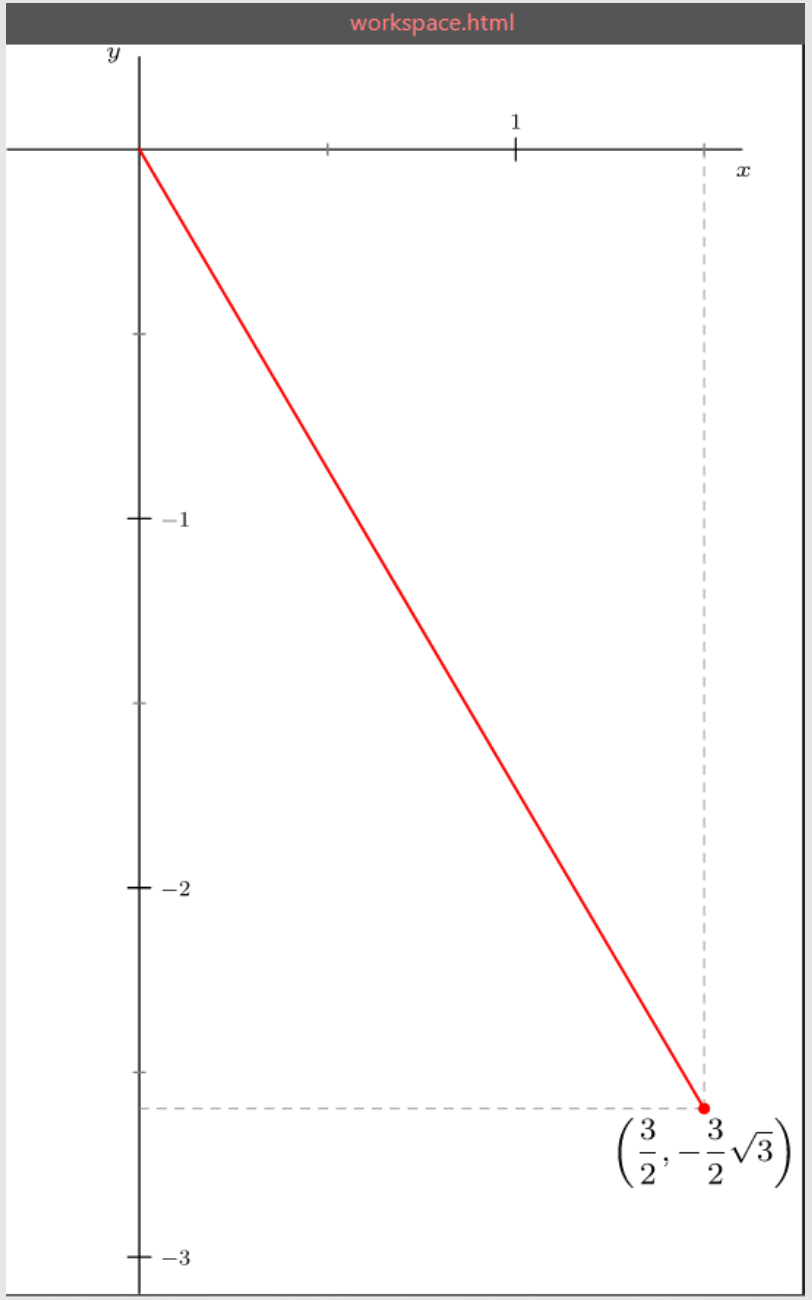
```
3
-60
```

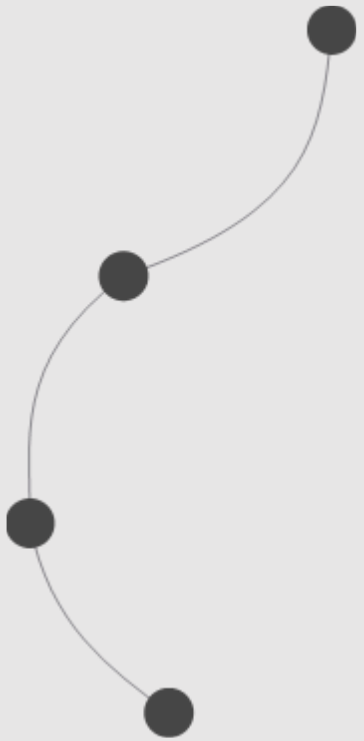
workspace.html



```
30 write(abs(z1));
31 write(degrees(theta));
```

```
3
-60
```





# Asymptote en Overleaf

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```
    \mbox{cotanh}^{-1}(x)=&\displaystyle \frac{1}{2}\ln \left
    (\frac{x+1}{x-1}\right)
\end{align}

\begin{figure}
\centering
\begin{asy}
import graph;
size(0,4inches,IgnoreAspect);
real lne(real x) {static real lne=log(exp(1)); return log(x)/lne;};
real f1(real x) {return acosh(x);}
real f2(real x) {return -acosh(x);}
real f3(real x) {return lne((1+sqrt(1-x^2))/(x));}
real f4(real x) {return -1*lne((1+sqrt(1-x^2))/(x));}
xaxis(Label("$x$",position=EndPoint, align=NE),LeftTicks,Arrow);
yaxis(Label("$y$",position=EndPoint, align=NE),RightTicks,Arrow);
label("$\cosh^{-1} (x)$",(1.75,.5),fontsize(12pt)+red);
label("$\mbox{sech}^{-1} (x)$",(1,2),fontsize(12pt)+blue);
draw(graph(f1,1,4),red);
draw(graph(f2,1,4),red);
draw(graph(f3,0.1,1),blue);
draw(graph(f4,0.1,1),blue);
\end{asy}
    \label{fig:acosh}
    \caption{Gr\'afica de $\cosh ^{-1} (x)$ y de $\mbox{sech}^{-1} (x)$}
\end{figure}
```

Recompile | 18

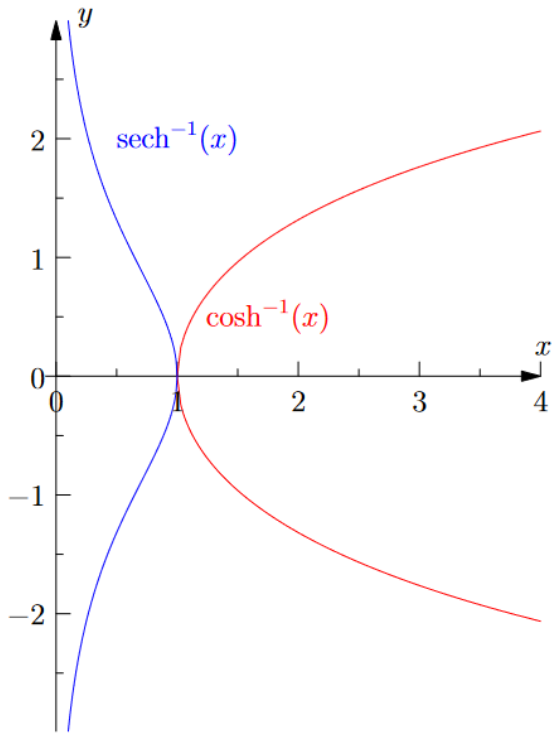


Figura 6.4: Gráfica de $\cosh^{-1}(x)$ y de $\text{sech}^{-1}(x)$

¡Muchas gracías!

¿Preguntas?