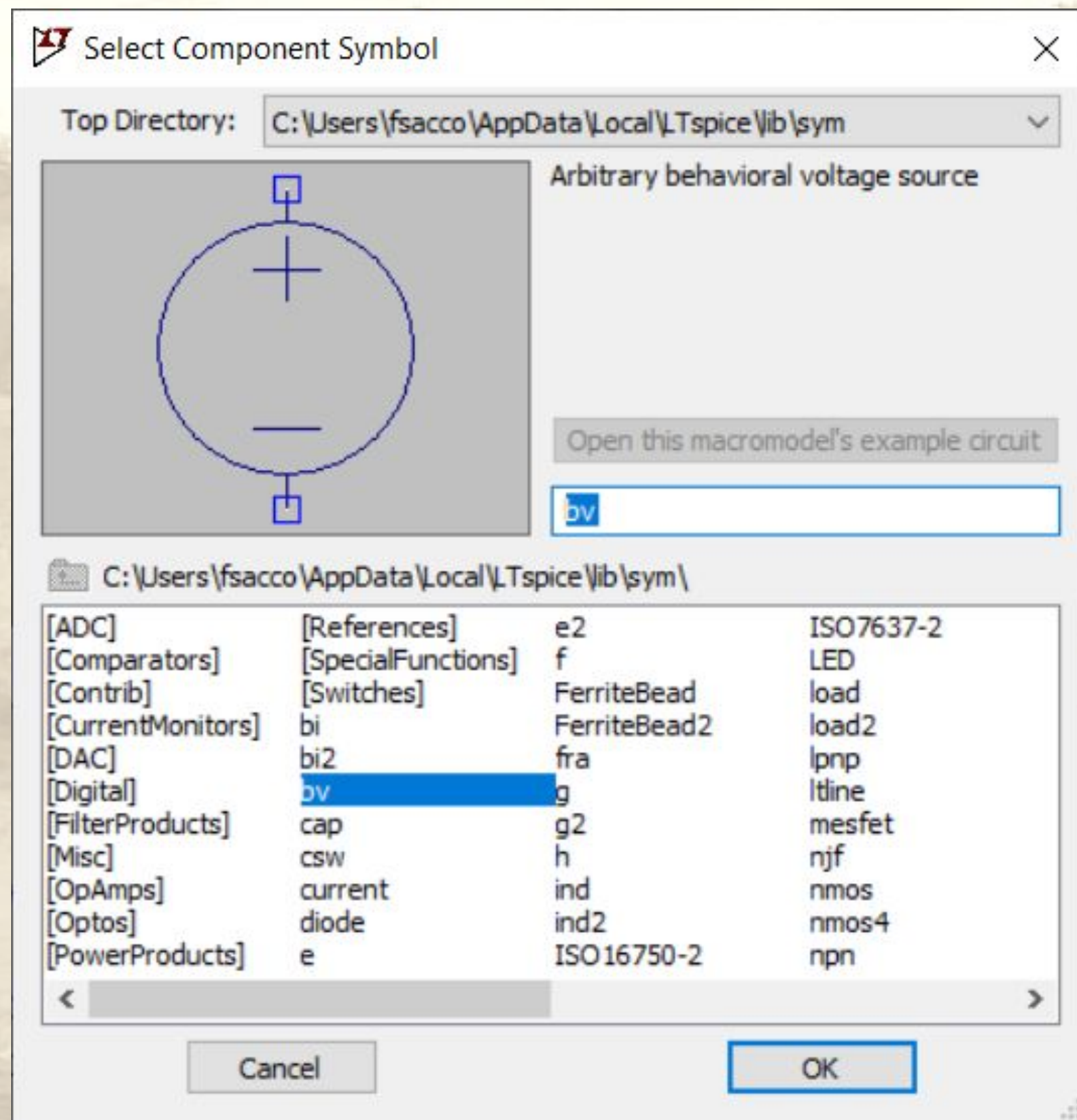


Drops of LTSpice



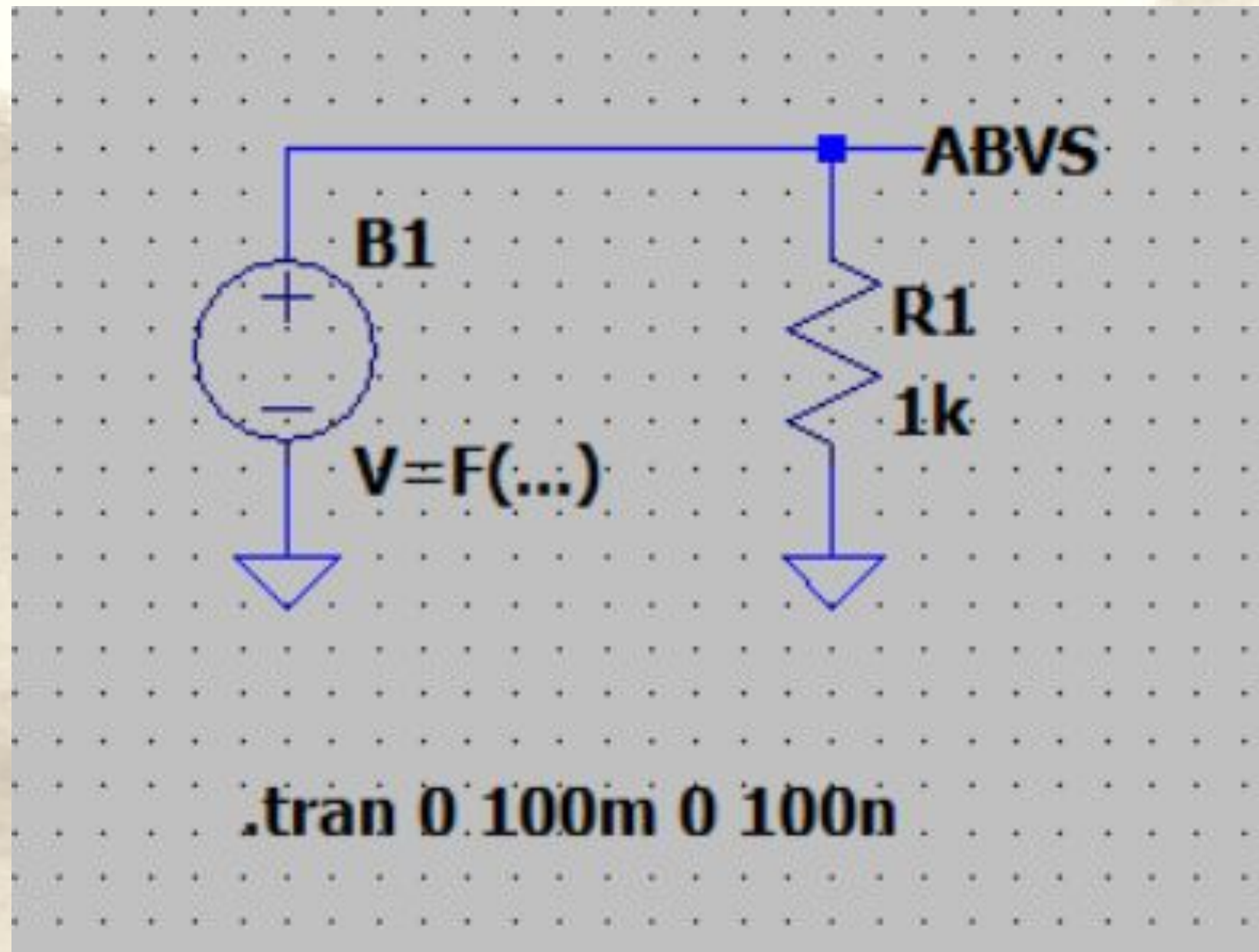
How to use the
Arbitrary Voltage Source

LTSpice contains a very interesting component...



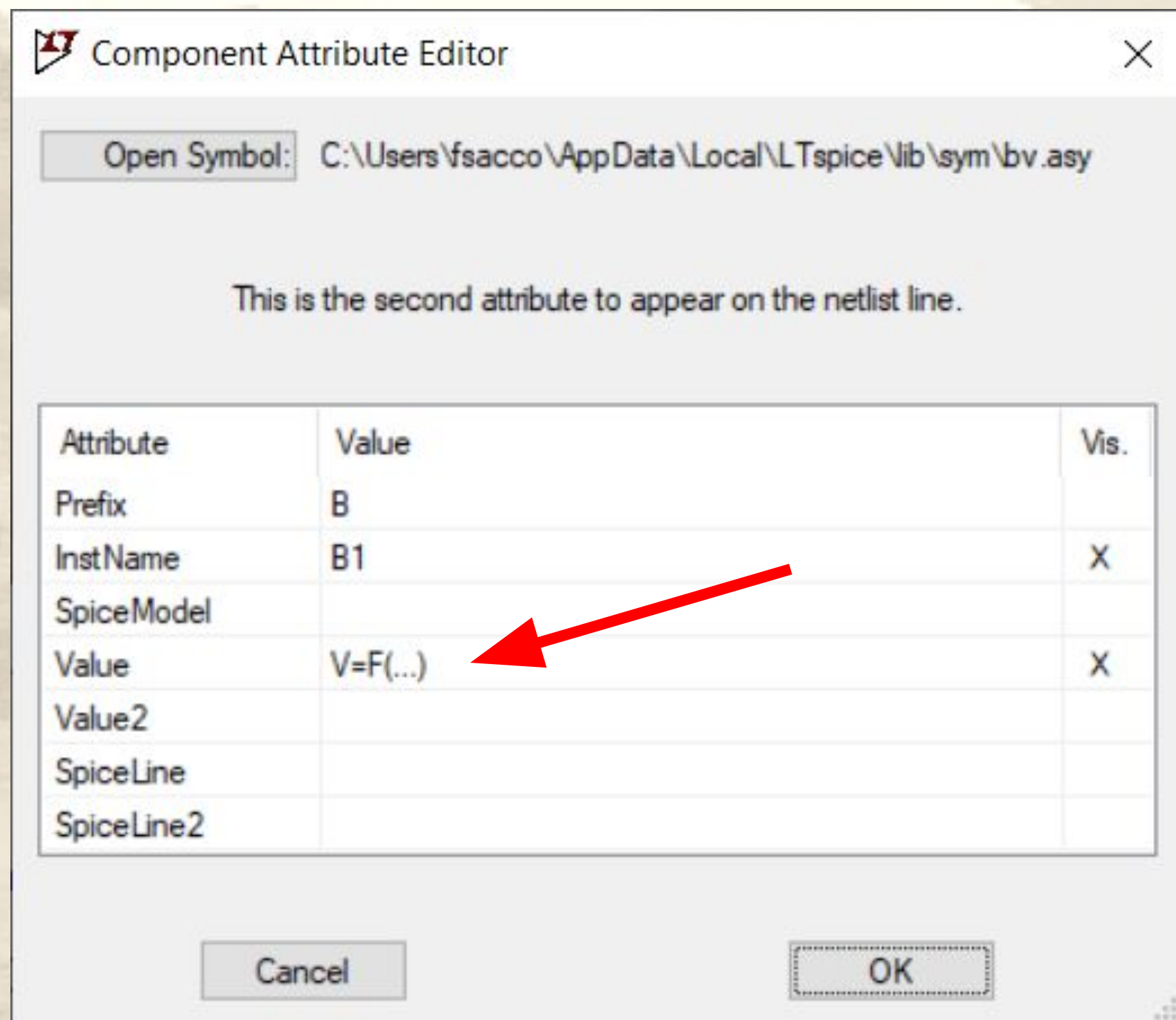
The
Arbitrary Behavioral Voltage Source

It looks like a standard voltage source.



But notice the
 $V=F(\dots)$

By editing the component, it is possible to add a mathematical function



Component Attribute Editor

Open Symbol: C:\Users\fsacco\AppData\Local\LTspice\lib\sym\bv.asy

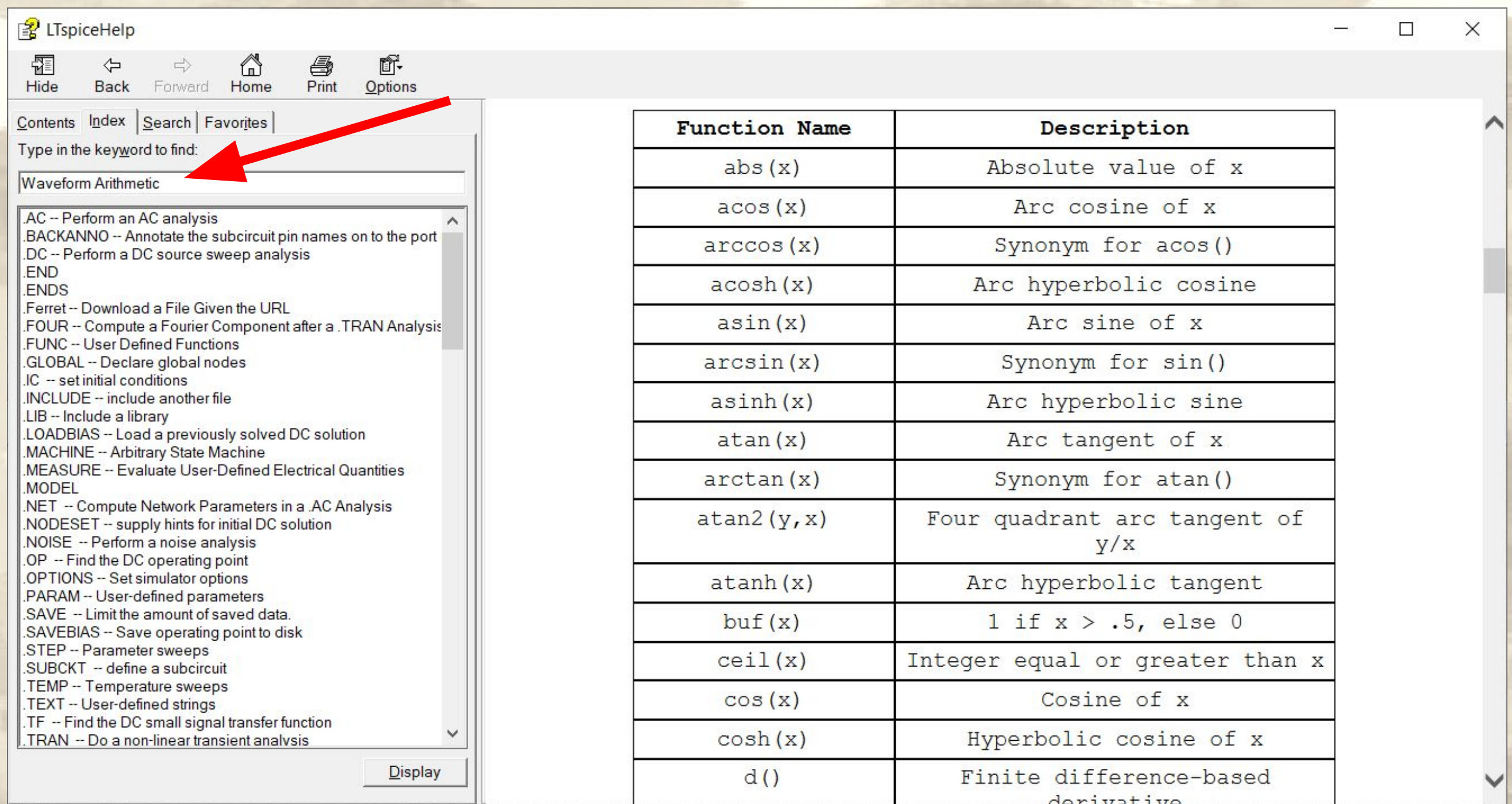
This is the second attribute to appear on the netlist line.

Attribute	Value	Vis.
Prefix	B	
InstName	B1	X
SpiceModel		
Value	V=F(...)	X
Value2		
SpiceLine		
SpiceLine2		

Cancel OK

This function will define the voltage behavior.

In the software's help window you can get details of all the functions that can be used, searching for
Waveform Arithmetic



The screenshot shows the LTspiceHelp window with the 'Search' tab selected. A red arrow points to the search bar, which contains the text 'Waveform Arithmetic'. The search results are displayed in a list on the left and a table on the right.

Search Results List:

- .AC -- Perform an AC analysis
- .BACKANNO -- Annotate the subcircuit pin names on to the port
- .DC -- Perform a DC source sweep analysis
- .END
- .ENDS
- .Ferret -- Download a File Given the URL
- .FOUR -- Compute a Fourier Component after a .TRAN Analysis
- .FUNC -- User Defined Functions
- .GLOBAL -- Declare global nodes
- .IC -- set initial conditions
- .INCLUDE -- include another file
- .LIB -- Include a library
- .LOADBIAS -- Load a previously solved DC solution
- .MACHINE -- Arbitrary State Machine
- .MEASURE -- Evaluate User-Defined Electrical Quantities
- .MODEL
- .NET -- Compute Network Parameters in a .AC Analysis
- .NODESET -- supply hints for initial DC solution
- .NOISE -- Perform a noise analysis
- .OP -- Find the DC operating point
- .OPTIONS -- Set simulator options
- .PARAM -- User-defined parameters
- .SAVE -- Limit the amount of saved data.
- .SAVEBIAS -- Save operating point to disk
- .STEP -- Parameter sweeps
- .SUBCKT -- define a subcircuit
- .TEMP -- Temperature sweeps
- .TEXT -- User-defined strings
- .TF -- Find the DC small signal transfer function
- .TRAN -- Do a non-linear transient analysis

Function Table:

Function Name	Description
abs(x)	Absolute value of x
acos(x)	Arc cosine of x
arccos(x)	Synonym for acos()
acosh(x)	Arc hyperbolic cosine
asin(x)	Arc sine of x
arcsin(x)	Synonym for sin()
asinh(x)	Arc hyperbolic sine
atan(x)	Arc tangent of x
arctan(x)	Synonym for atan()
atan2(y,x)	Four quadrant arc tangent of y/x
atanh(x)	Arc hyperbolic tangent
buf(x)	1 if x > .5, else 0
ceil(x)	Integer equal or greater than x
cos(x)	Cosine of x
cosh(x)	Hyperbolic cosine of x
d()	Finite difference-based derivative

But I will demonstrate some of them.

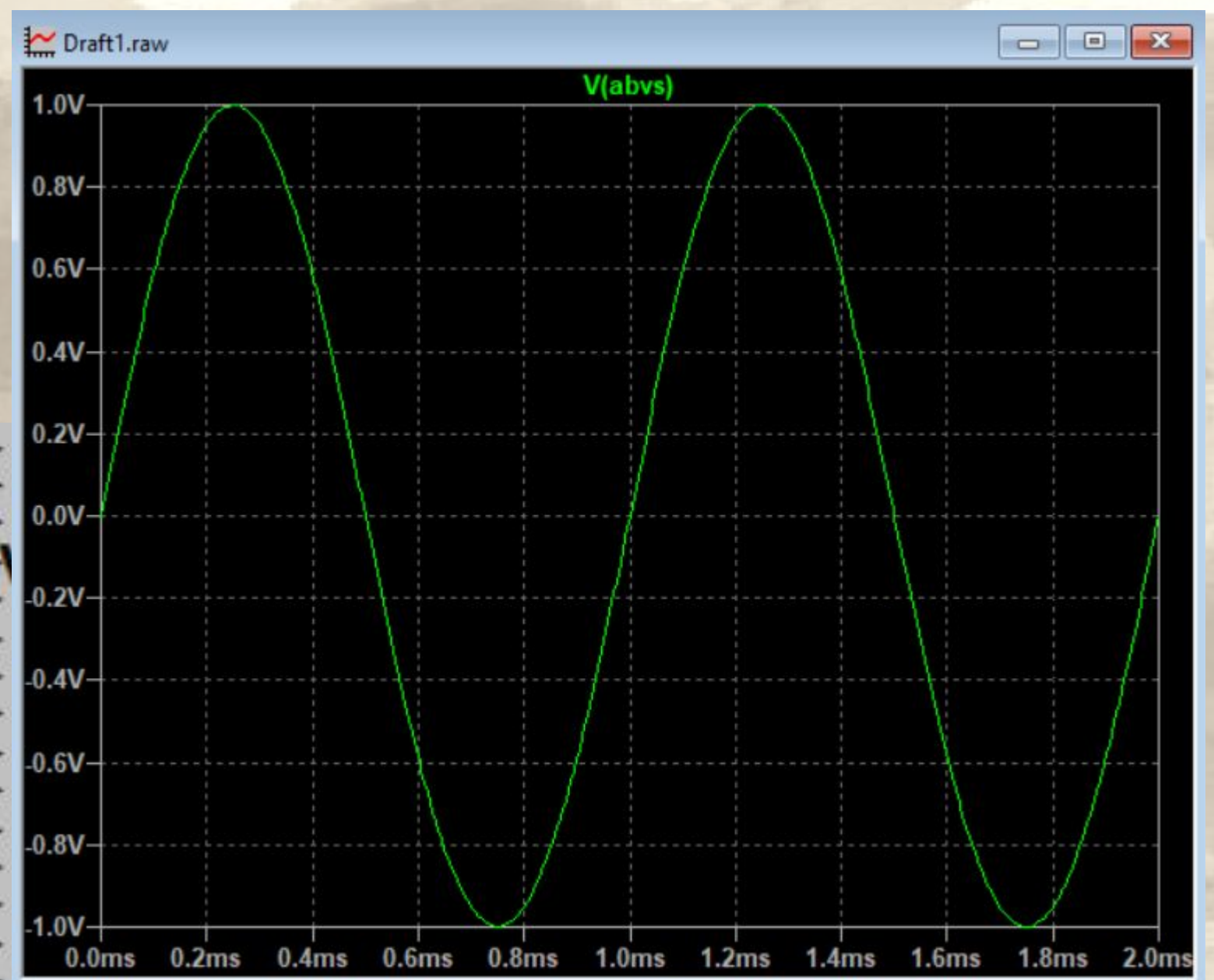
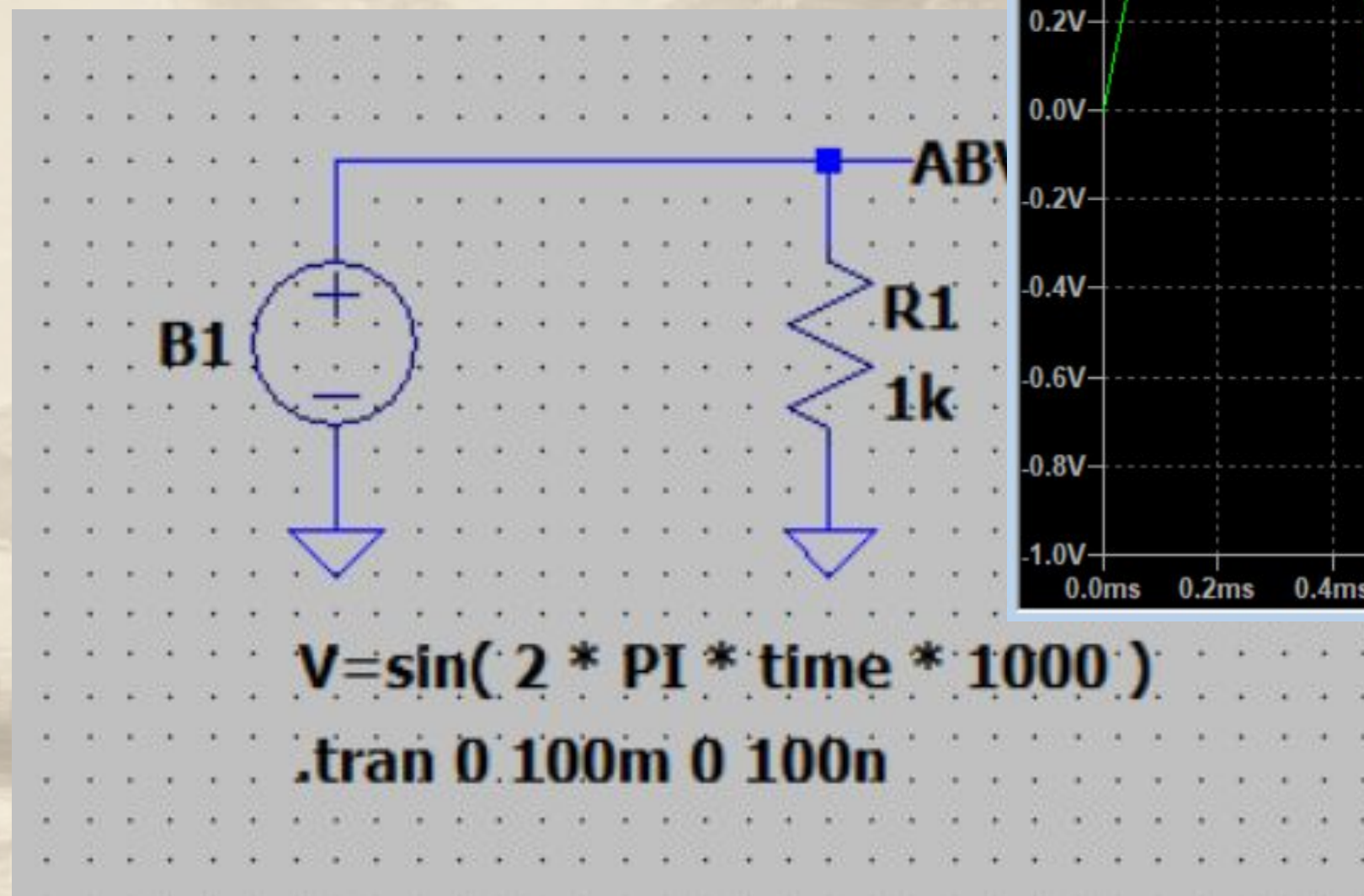
There are some constants that you can use. The pi, for example.

Name	Value
E	2.7182818284590452354
pi	3.14159265358979323846
K	1.3806503e-23
Q	1.602176462e-19

time is another important keyword!

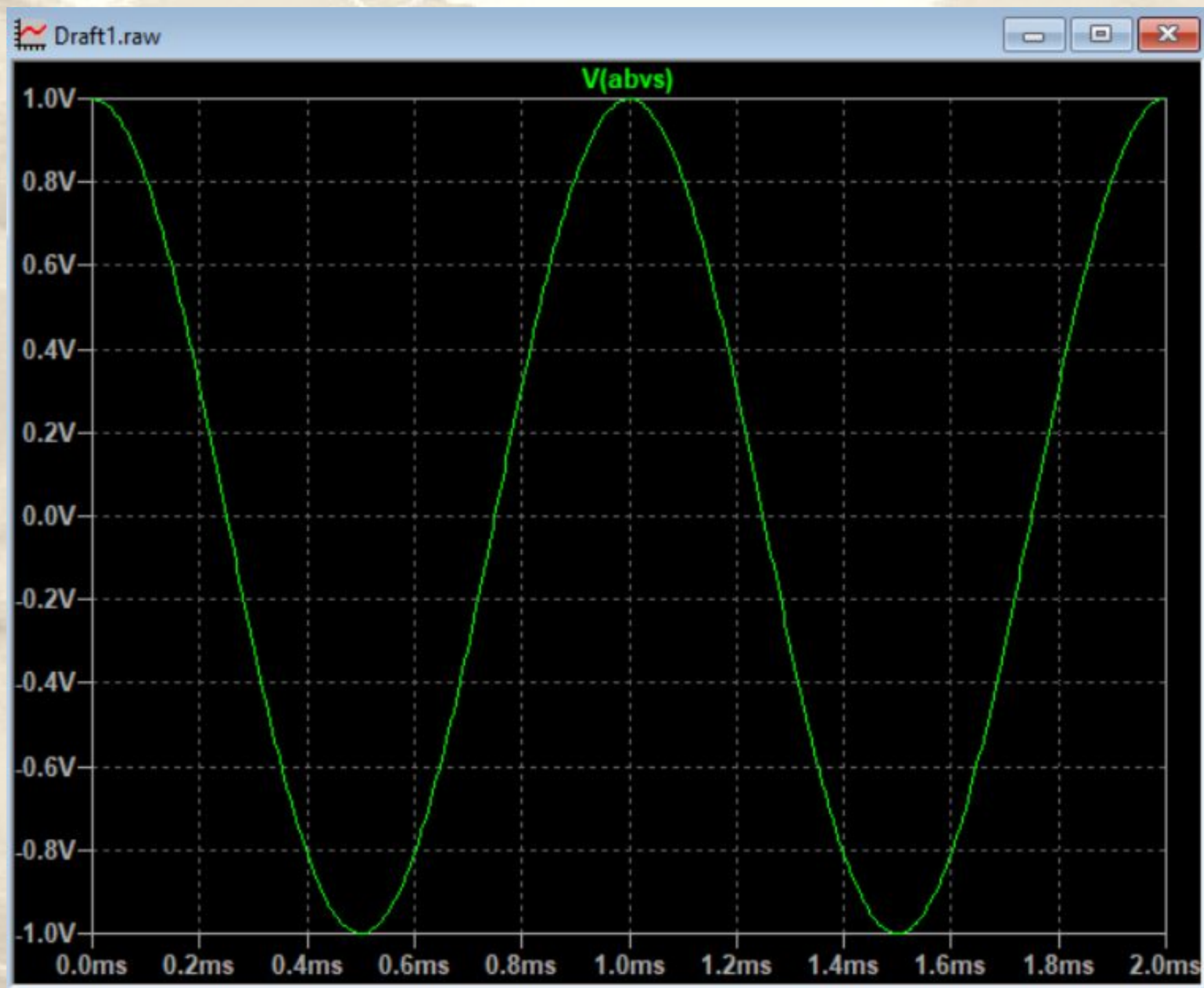
To have a 1kHz sinusoidal signal,
the function is

$$V = \sin(2 * \text{PI} * \text{time} * 1000)$$



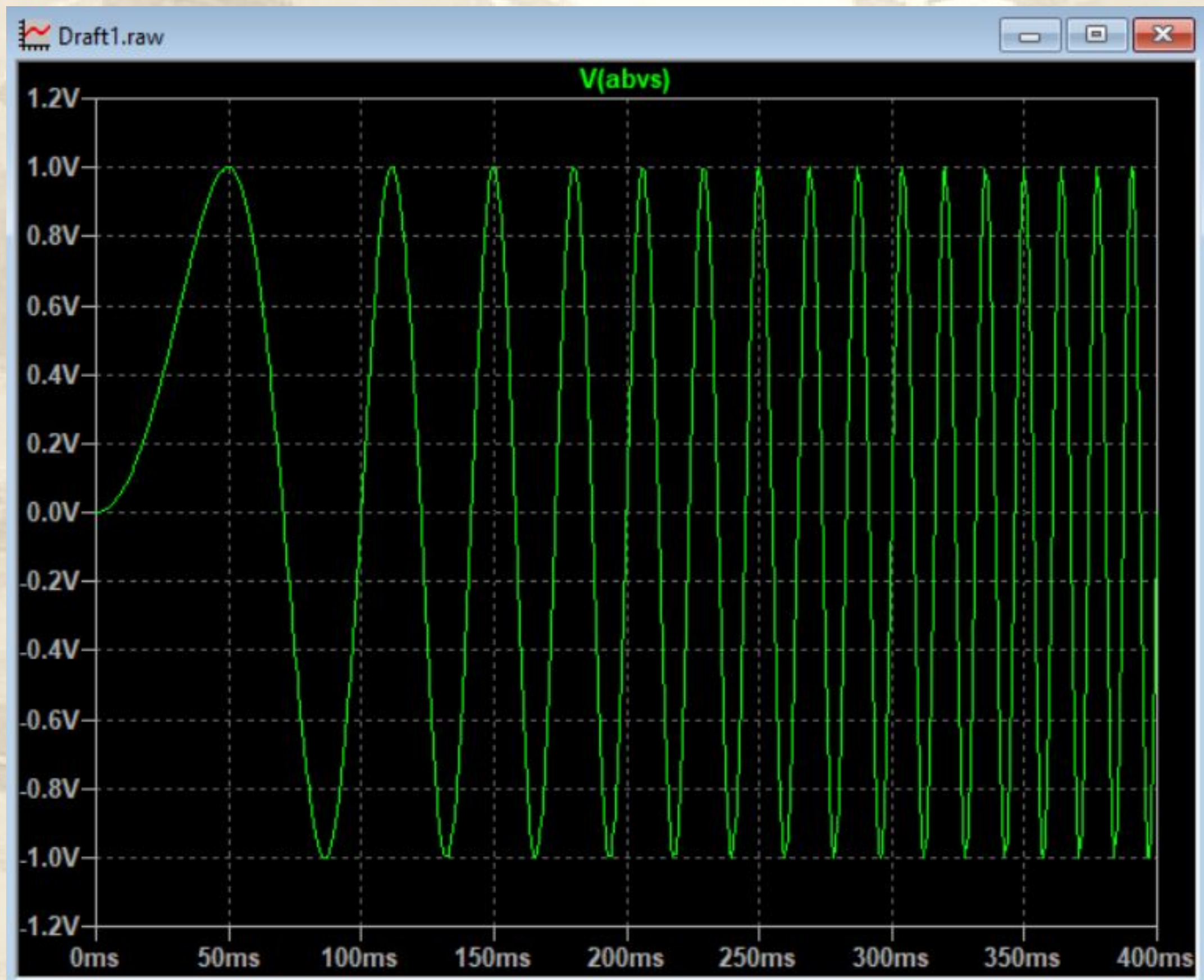
And to have a cosine...

$$V = \cos(2 * \text{PI} * \text{time} * 1000)$$

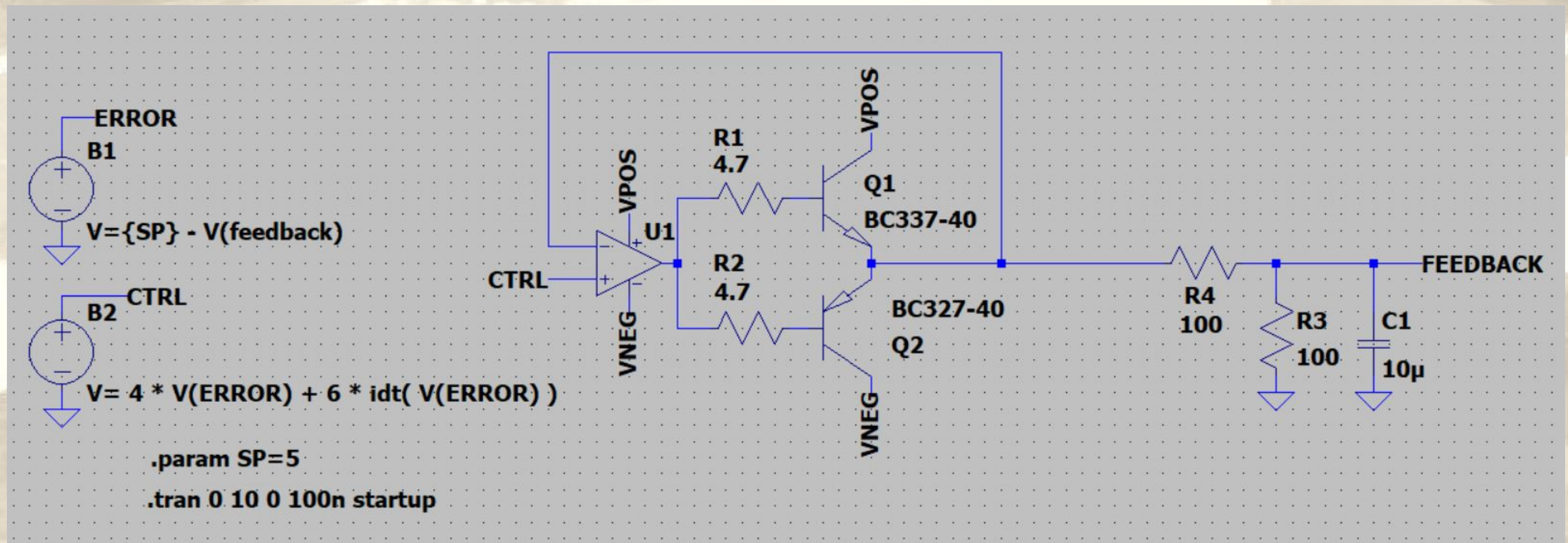


LTSpice allows advanced functions

$$V = \sin(2 * \text{PI} * 100 * \text{time} ** 2)$$



Very advanced functions.



Here we use an arbitrary source to calculate the error, and the result is fed to another to perform a PI.

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