

Margines zakłóceń w bramkach cyfrowych

Definicja i wyznaczanie w CADENCE

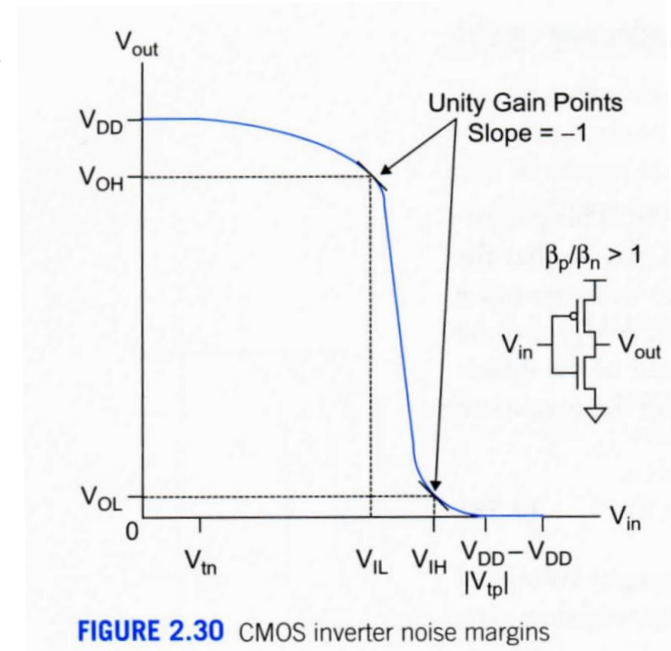
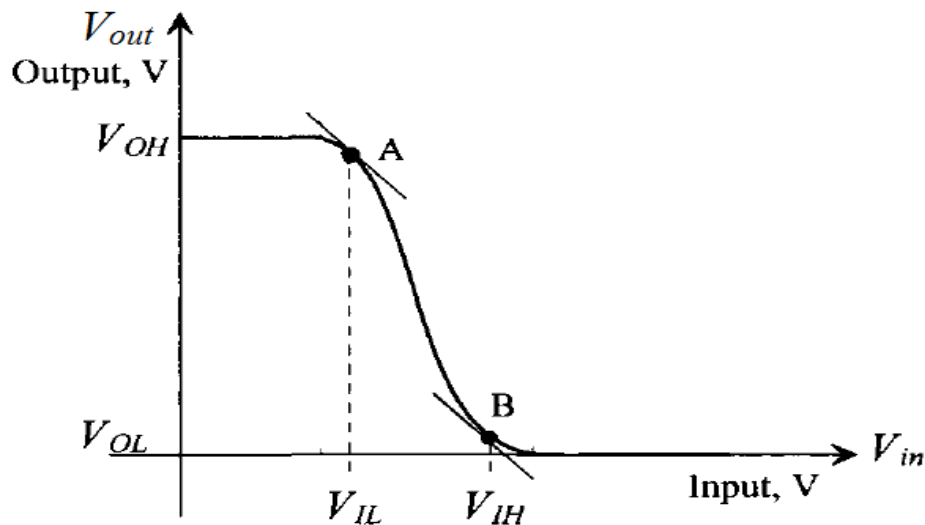
Margines zakłóceń – definicja

- *margines zakłóceń dla stanu wysokiego to:*

$$M_H = V_{OH} - V_{IH}$$

- *margines zakłóceń dla stanu niskiego to:*

$$M_L = V_{IL} - V_{OL}$$



Ch-ka przejściowa inwertera – sposób wyznaczania marginesów zakłóceń

Margines zakłóceń – definicja

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CMOS Circuit Design, Layout, and Simulation

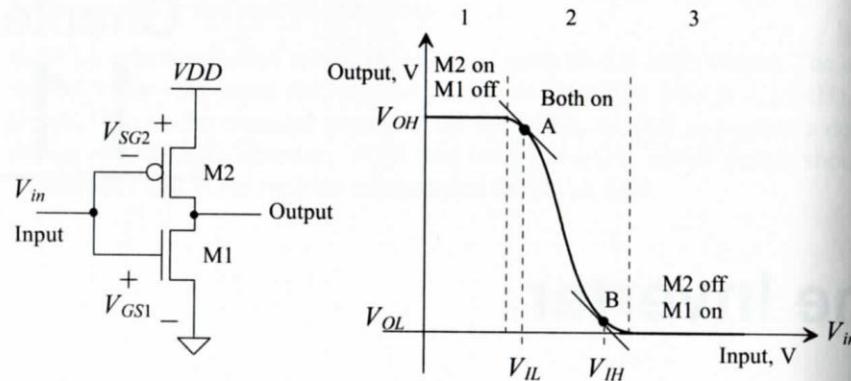


Figure 11.2 The CMOS inverter transfer characteristics.

The maximum output “high” voltage is labeled V_{OH} and the minimum output “low” voltage, V_{OL} . Points A and B on this curve are defined by the slope of the transfer curves equaling -1 . Input voltages less than or equal to the voltage V_{IL} , defined by point A, are considered a logic low on the input of the inverter. Input voltages greater than or equal to the voltage V_{IH} , defined by point B, are considered a logic high on the input of the inverter. Input voltages between V_{IL} and V_{IH} do not define a valid logic voltage level. Ideally, the difference in V_{IL} and V_{IH} is zero; however, this is never the case in real logic circuits.

R.J. Baker, "CMOS Circuit Design, Layout, and Simulation", Wiley, 2010, p. 332

Margines zakłóceń – definicja

V_{IH} = minimum HIGH input voltage
 V_{IL} = maximum LOW input voltage
 V_{OH} = minimum HIGH output voltage
 V_{OL} = maximum LOW output voltage

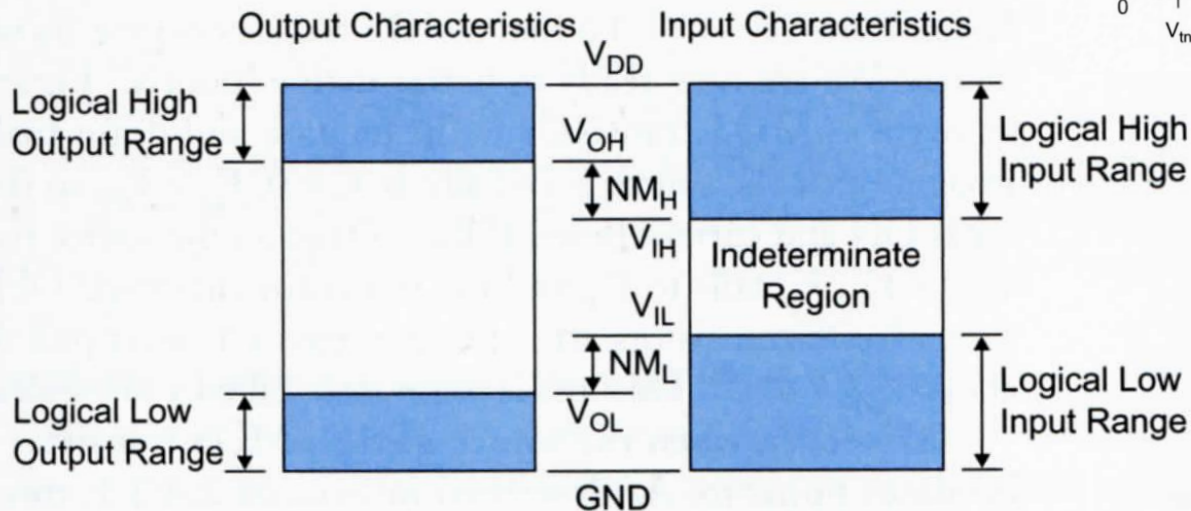
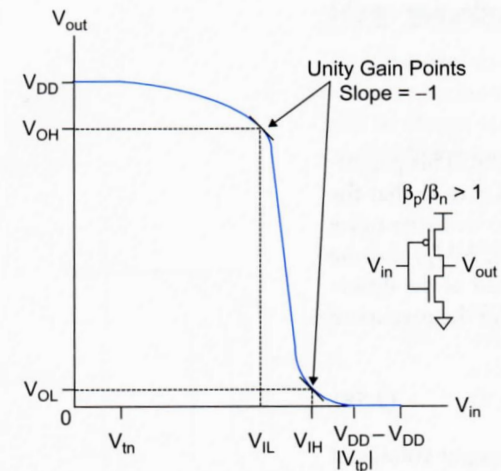
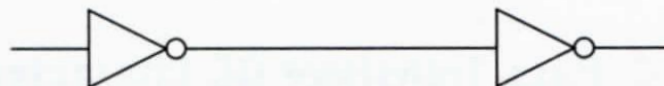
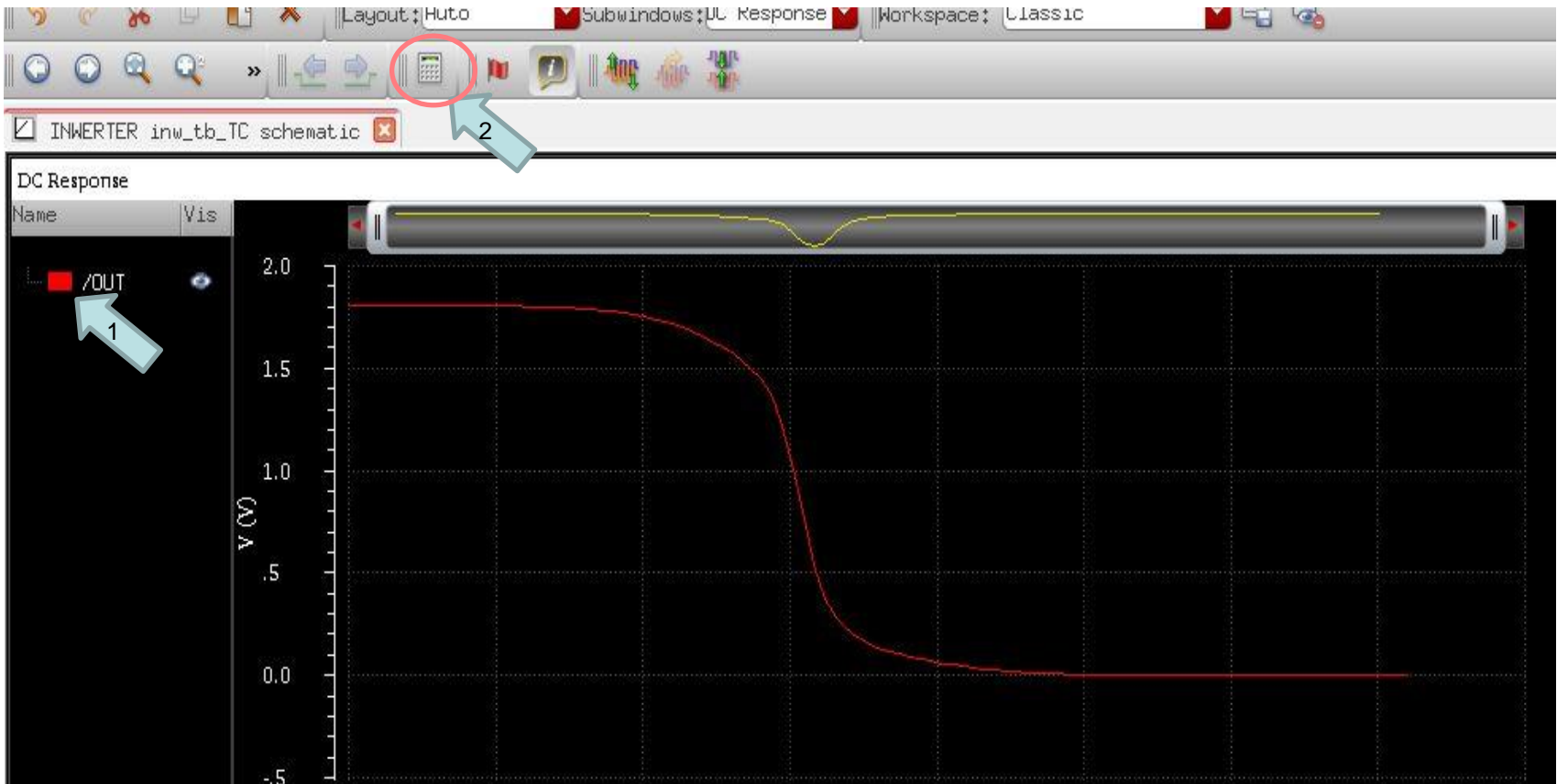


FIGURE 2.29 Noise margin definitions

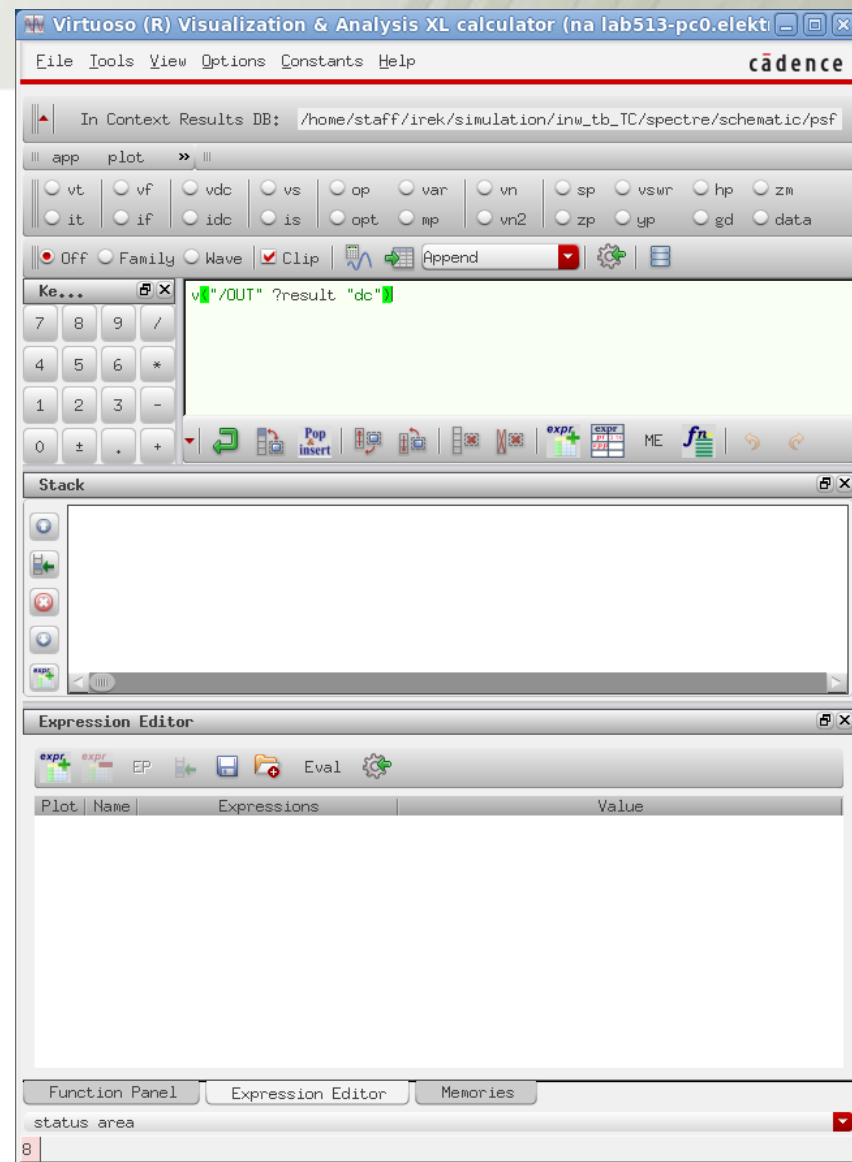
Margines zakłóceń – wyznaczanie

Ch-ka przejściowa inwertera



Margines zakłóceń – wyznaczanie

Okno kalkulatora



Margines zakłóceń – wyznaczanie

Okno kalkulatora

- Otwórz
Function Panel

Virtuoso (R) Visualization & Analysis XL calculator (na lab513-pc0.elekt)

File Tools View Options Constants Help

In Context Results DB: /home/staff/irek/simulation/inw_tb_TC/spectre/schematic/psf

app plot

vt vf vdc vs op var vn sp vswr hp zm
it if idc is opt mp vn2 zp yp gd data

Off Family Wave Clip Append

Ke... v"/>

Stack

Function Panel

Special Functions

PN	dft	getAsciiWave	peakToPeak	rshift	ymax
a2d	dftbb	groupDelay	period_jitter	sample	ymin
abs_jitter	dnl	harmonic	phaseMargin	settlingTime	
average	dutyCycle	harmonicFreq	phaseNoise	slewRate	
bandwidth	evmQAM	histo	pow	spectralPower	
clip	evmQpsk	iinteg	prms	spectrum	
compare	eyeDiagram	integ	psd	spectrumMeas	
compression	fallTime	intersect	psddb	stddev	
compressionVRI	flip	ipn	pstddev	tangent	
convolve	fourEval	ipnVRI	pzbode	thd	
cross	freq	loadpull	pzfilter	unityGainFreq	
d2a	freq_jitter	lshift	riseTime	value	
dBm	frequency	overshoot	rms	xmax	
delay	gainBwProd	pavg	rmsNoise	xmin	
deriv	gainMargin	peak	root	xval	

Function Panel Expression Editor Memories

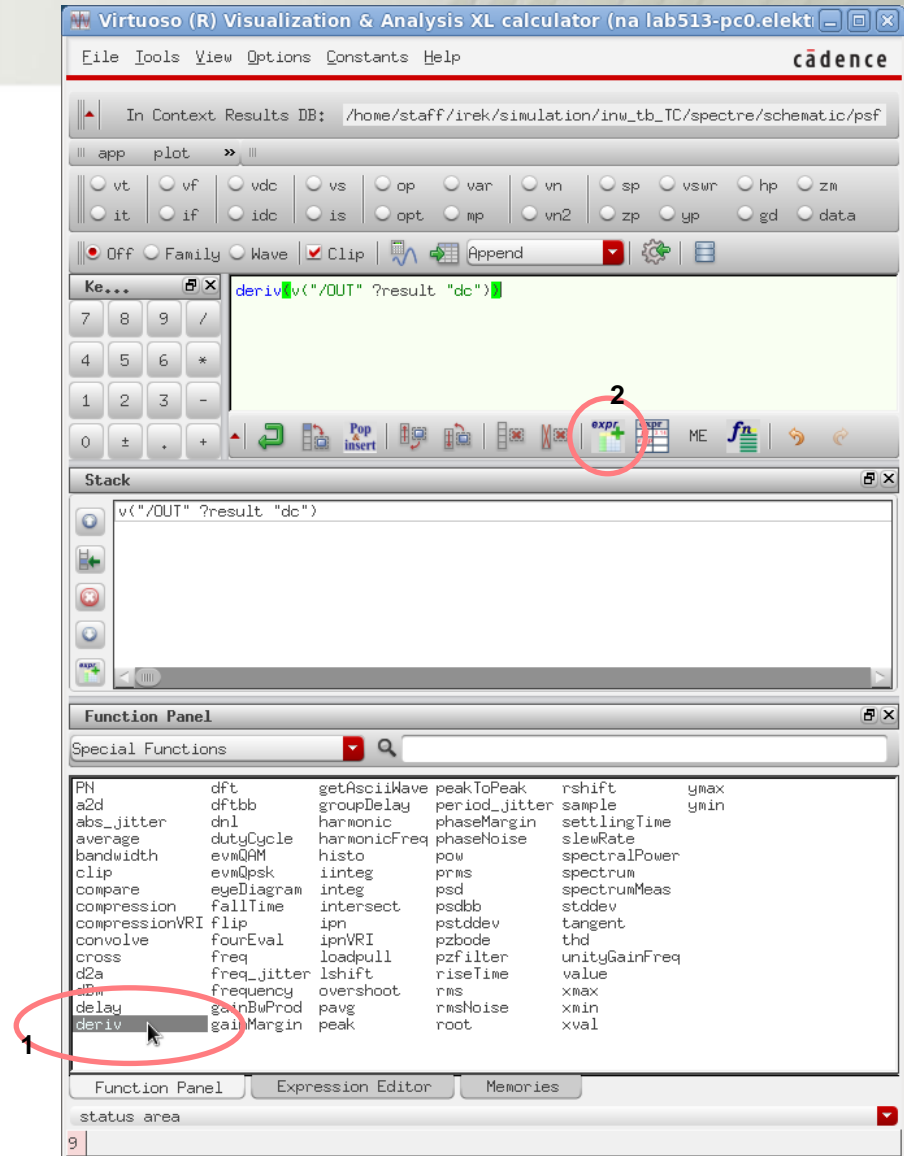
status area

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Margines zakłóceń – wyznaczanie

Okno kalkulatora

1. Wybierz pochodną – deriv
2. Dodaj wyrażenie do Expression Editor



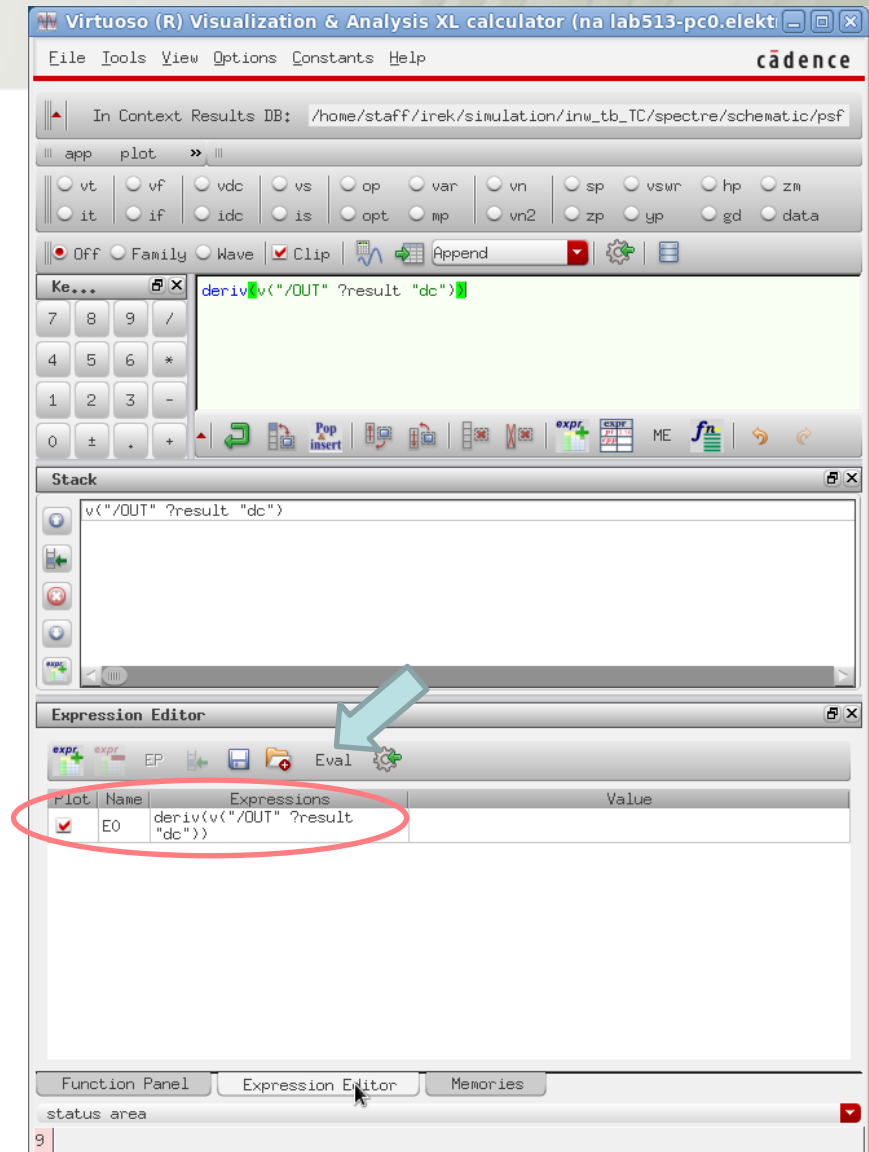
The screenshot shows the Virtuoso (R) Visualization & Analysis XL calculator interface. The main workspace contains the expression `deriv v(\"/OUT\" ?result \"dc\")`. A red circle labeled '2' highlights the 'expr' icon in the toolbar. Below the workspace is a 'Stack' panel showing the current expression. At the bottom is a 'Function Panel' with a search bar and a grid of functions. A red circle labeled '1' highlights the 'deriv' function in the grid.

Special Functions					
PN	dft	getAsciiWave	peakToPeak	rshift	ymin
a2d	dftbb	groupDelay	period_jitter	sample	ymax
abs_jitter	dnl	harmonic	phaseMargin	settlingTime	
average	dutyCycle	harmonicFreq	phaseNoise	slewRate	
bandwidth	evmQAM	histo	pow	spectralPower	
clip	evmQpsk	iinteg	prms	spectrum	
compare	eyeDiagram	integ	psd	spectrumMeas	
compression	fallTime	intersect	psddb	stddev	
compressionVRI	flip	ipn	pstdev	tangent	
convolve	fourEval	ipnVRI	pzbode	thd	
cross	freq	loadpull	pzfilter	unityGainFreq	
d2a	freq_jitter	lshift	riseTime	value	
d2m	frequency	overshoot	rms	xmax	
delay	gainBwProd	pavg	rmsNoise	xmin	
deriv	gainMargin	peak	root	xval	

Margines zakłóceń – wyznaczenie

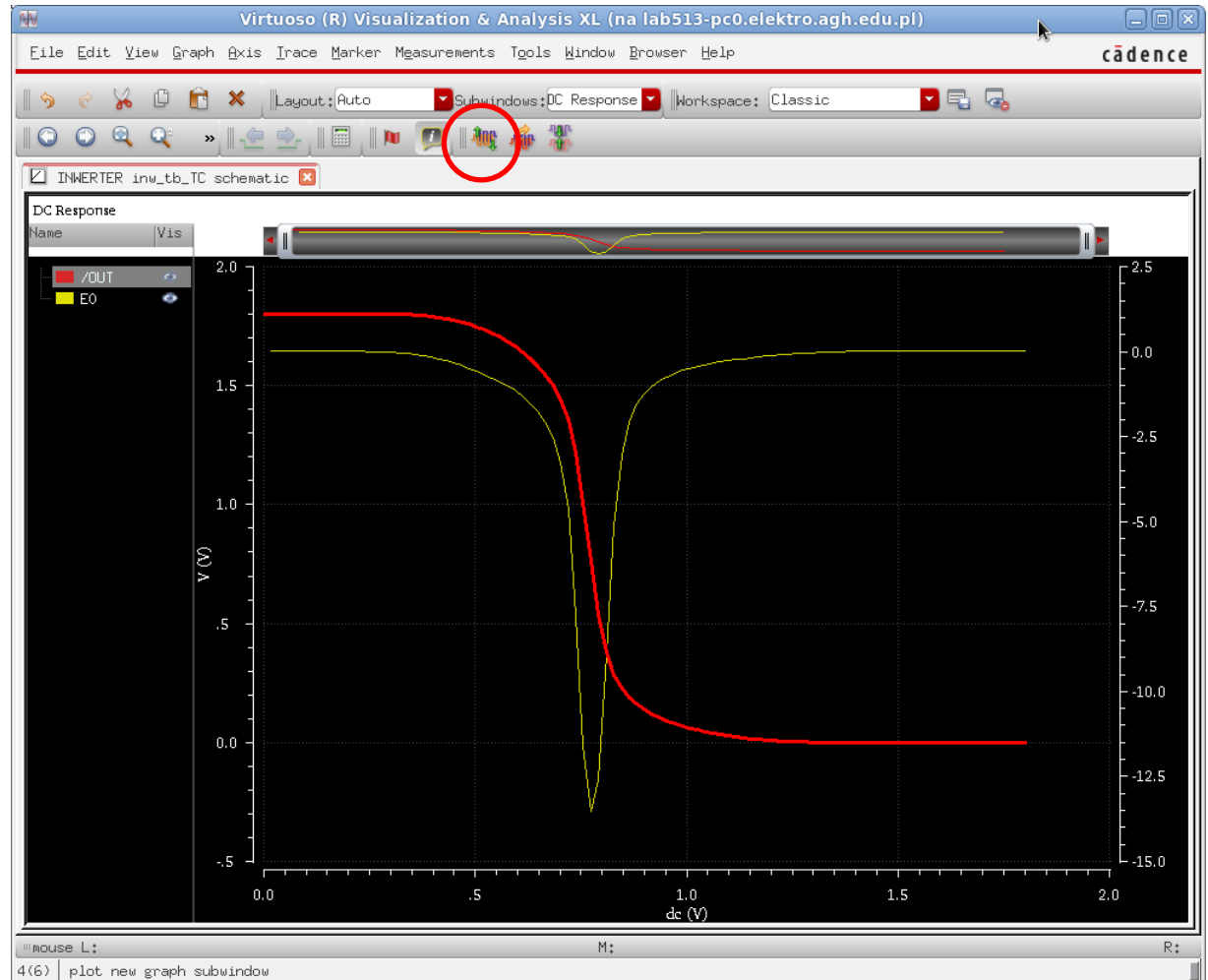
Okno kalkulatora

1. Oblicz wyrażenie – Eval



Margines zakłóceń – wyznaczanie

Wynik obliczeń



Margines zakłóceń – wyznaczanie

Wyznaczanie napięć

