

# **Komputerowe wspomaganie eksperymentu**

## **4**

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# Temat na dziś

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Funkcje matematyczne  
Funkcje graficzne i dźwięk



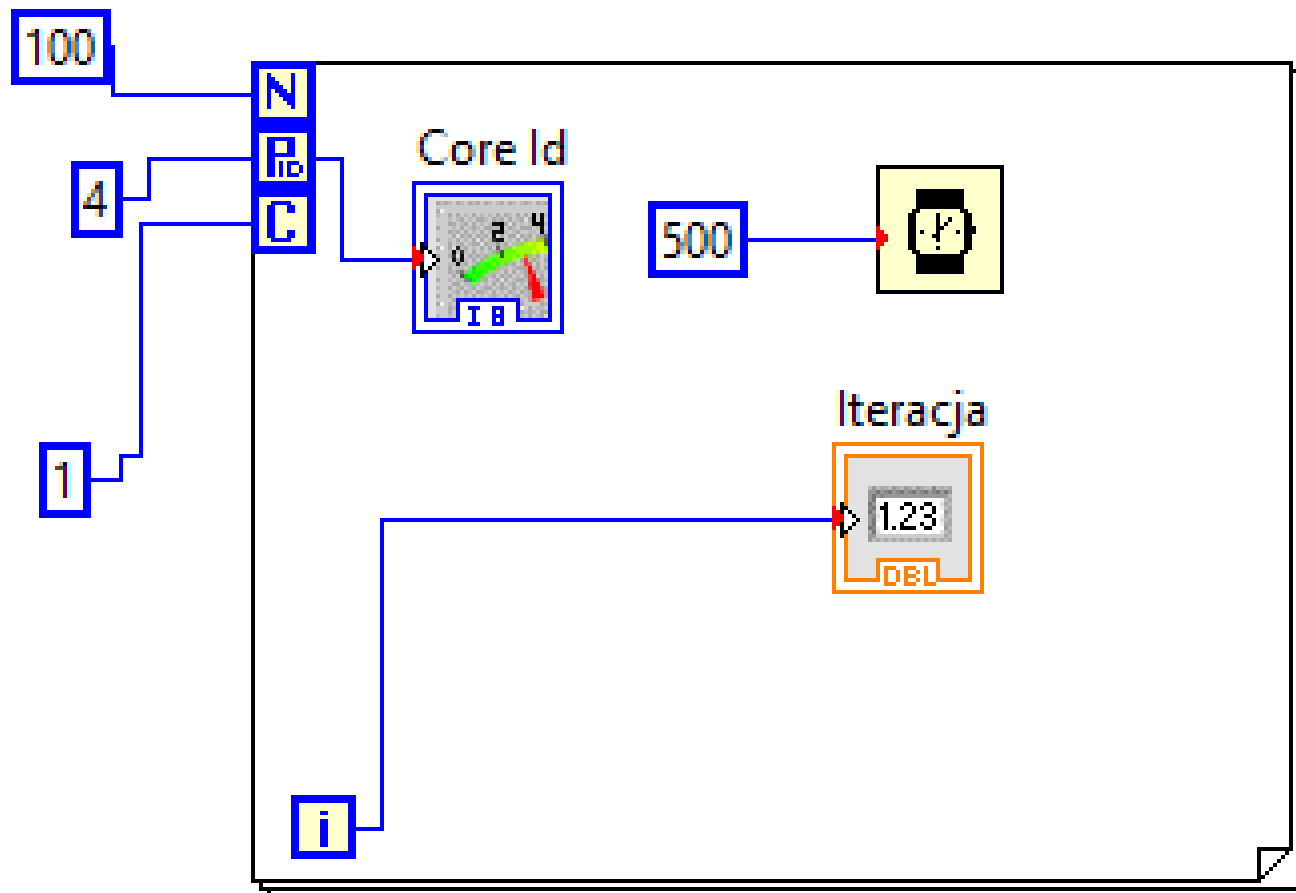
ni.com

(część materiałów zaczerpnięta ze  
strony producenta)

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# Obliczenia równoległe

- configure iteration parallelism



# Funkcje matematyczne



- zaawansowane funkcje matematyczne

## NI\_Gmath.lvlib:Differentiation.vi

number of points  
start  
end  
formula

Calculates both  
derivative of a  
at equidistant points

### Terminal Data

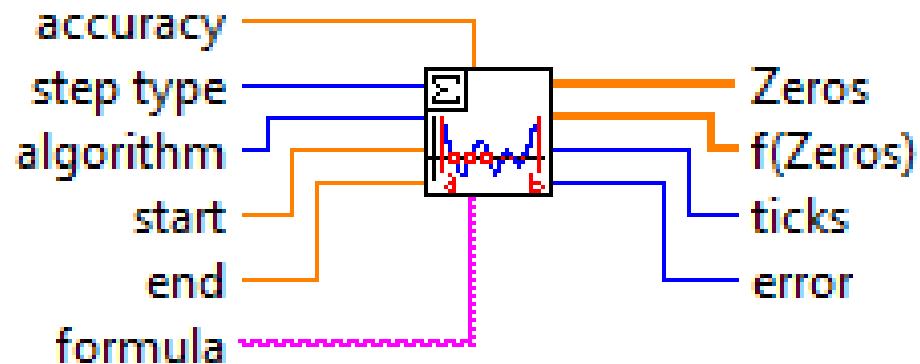
 Derivative of  
 (double)

## NI\_Gmath.lvlib:Integration.vi

start  
end  
formula

Calculates both  
of a 1D function  
function is defined  
points to be  
the given function

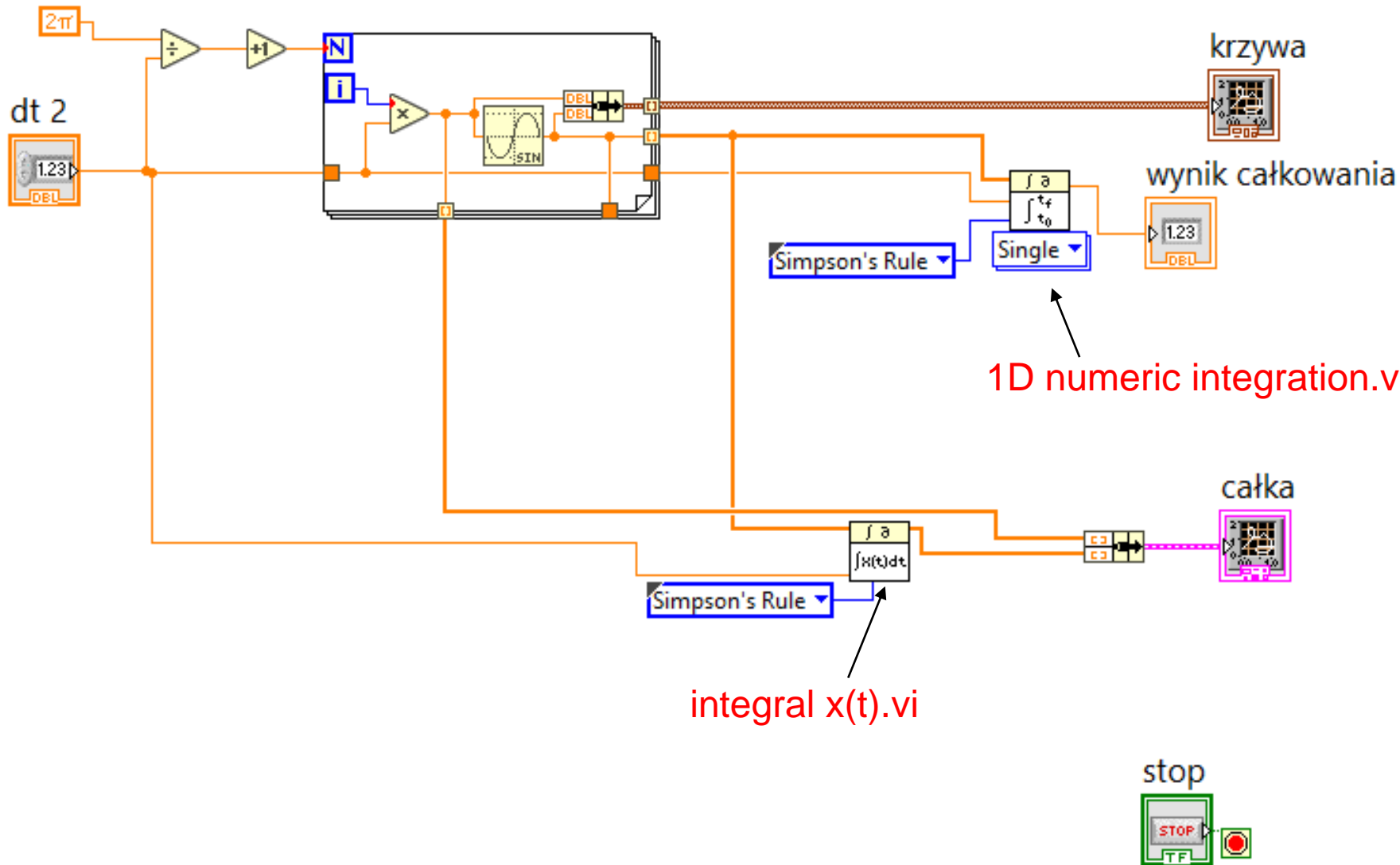
## NI\_Gmath.lvlib:Find All Zeros of f(x) (Formula).vi



Determines all zeros of a 1D function in a given interval. You must manually select the polymorphic instance to use.

# Funkcje matematyczne

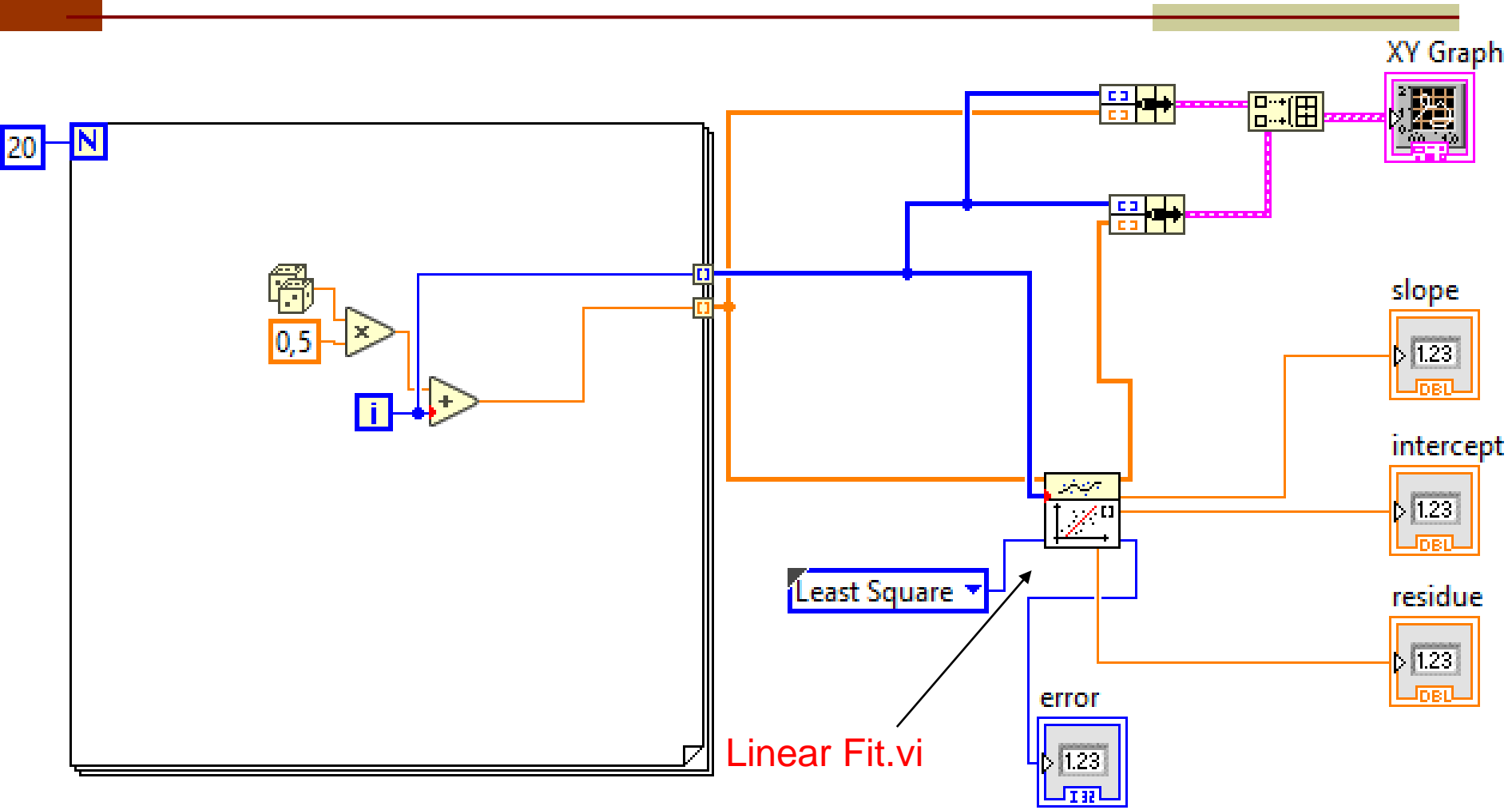
2018



1D numeric integration.vi

integral x(t).vi

# Funkcje matematyczne



# Funkcje matematyczne

- Mathematics / Differential Equations
  - Ordinary Differential Equations

## NI\_Gmath.lvlib:ODE Solver.vi

data  
ODE F(X,  
)  
simulation paramete  
error in (no erro  
h  
Solves ordinary differ  
conditions of the foll  
manually select the p

F(X,t) (right side  
Solves ordinary  
the Runge Kutta

**Terminal Data**  
ca F(X,t) (right  
abc (string)

## NI\_Gmath.lvlib:ODE Runge Kutta 4th Order.vi

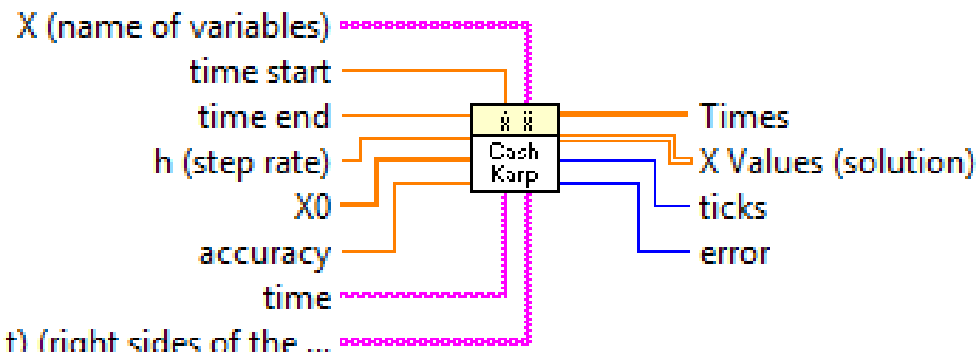
X (name of  
h

F(X,t) (right sides of the ...  
Solves ordinary differential equations with initial conditions using the

### Terminal Data Type

ca X0 (1D array of  
dbl (double [64-bit real (~15 digit precision)])

## NI\_Gmath.lvlib:ODE Cash Karp 5th Order.vi



Solves ordinary differential equations with initial conditions using the Cash Karp method.

# Funkcje matematyczne

- Mathematics / Differential Equations
  - Ordinary Differential Equations

## NI\_Gmath.lvlib:ODE Euler Method.vi

X (name of variable) NI\_Gmath.lvlib:ODE Linear nth Order Numeric.vi

time step

time

h (step rate)

A (a0, a1, ..., an-1)

## NI\_Gmath.lvlib:ODE Linear nth Order Symbolic.vi

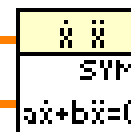
number of points

time

time

A (a0, a1, ..., an-1)

X0



formula

error

F(X,t) (right sides of the

Solves ordinary differential equations using the Euler method.

Solves an nth-order differential equation in numeric form.

Solves an nth-order, homogeneous linear differential equation with constant coefficients in symbolic form.

### Terminal Data Type

**CA** X (1D array of

**DEL** (double [64-bit real (~15 digit precision)])



# Funkcje matematyczne

- Mathematics / Differential Equations
  - Ordinary Differential Equations

## NI\_Gmath.lvlib:ODE Linear System Numeric.vi

A (matrix of  
X  
num

## NI\_Gmath.lvlib:ODE Linear System Symbolic.vi

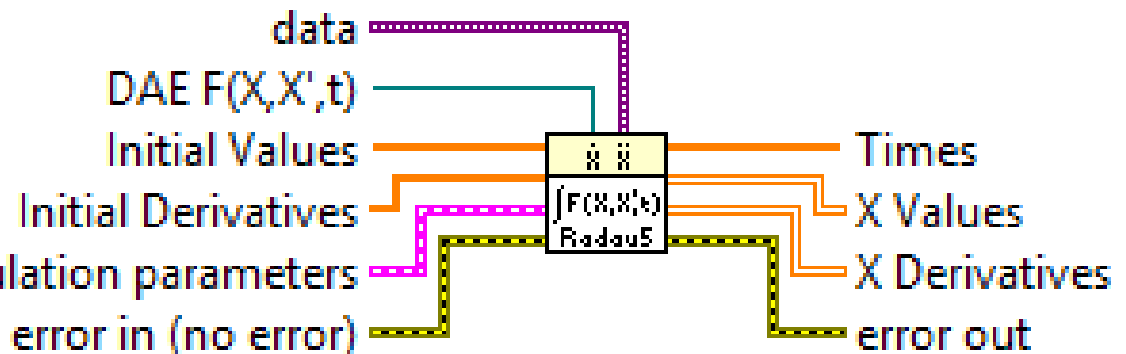
A (mat

## NI\_DAE.lvlib:DAE Radau 5th Order.vi

Solves  
equati  
Solves an n-  
differential e  
given start c  
eigenv  
matrix.

Solves  
equati  
Solves an n-  
differential e  
given start c  
eigenv  
matrix.

Solves differential algebraic equations (DAEs) with initial conditions by using the Radau IIA method. You must manually select the polymorphic instance to use.



# Grafika i dźwięk w LabView

## Programming/Graphics and Sound

### Graphics & Sound VI's

- tworzenie własnej oprawy graficznej
- importowanie/eksportowanie plików graficznych
- odtwarzanie dźwięków.

**3D Graph Properties** – tworzenie obrazów 3D

**Picture Plots** – tworzenie np. figur geometrycznych

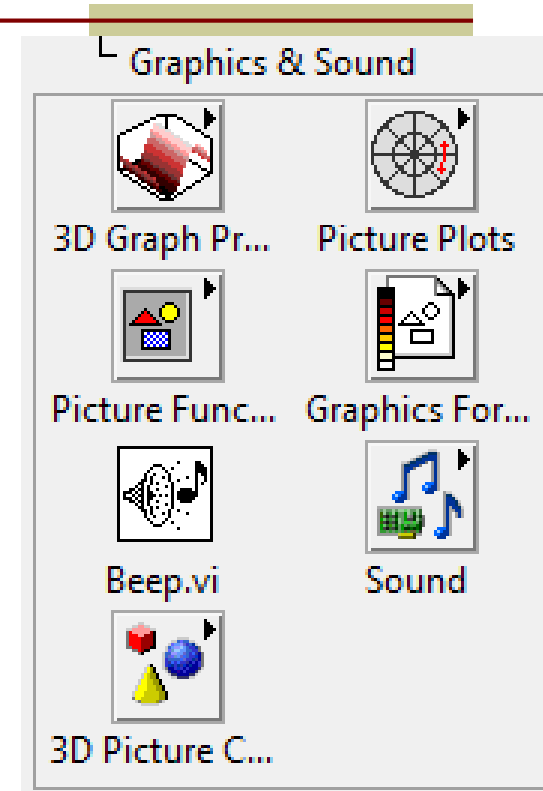
**Picture Functions** – funkcje „obróbki” obrazu

**Graphics Formats** – wczytywanie/zapisywanie obrazów w formatach:  
BMP, JPEG i PNG

**Beep.vi** – odtwarzanie dźwięku o danej częstotliwości

**Sound** – funkcje odtwarzania dźwięku

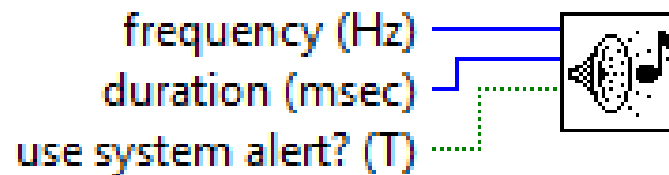
**3D Picture Control** – obiekty 3D, transformacje



# Grafika i dźwięk w LabView

## Programming/Graphics and Sound/Sound

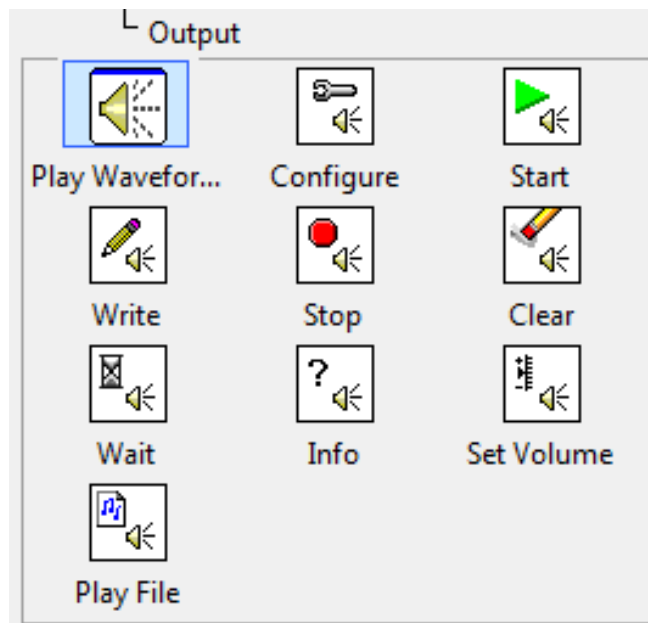
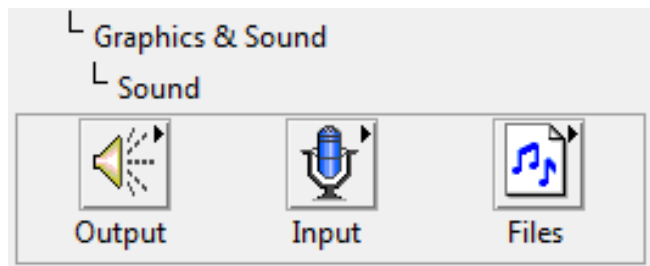
### Beep.vi



Causes the system to issue an audible tone.

# Grafika i dźwięk w LabView

## Programming/Graphics and Sound/Sound

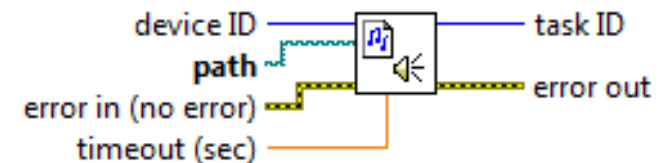


### Play Waveform



Plays data from the sound output device using finite sampling. This Express VI automatically configures an output task and clears the task after the output completes.

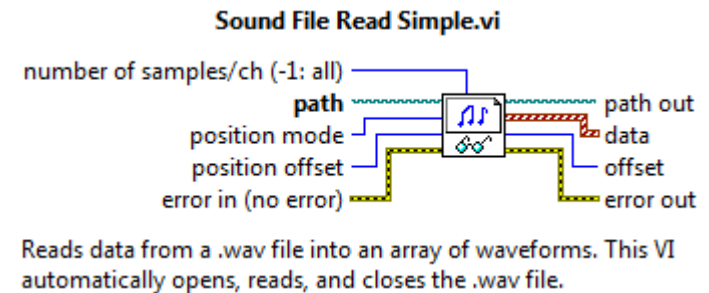
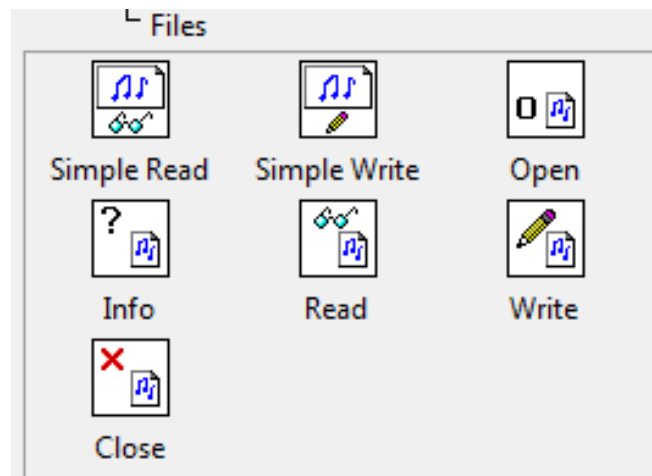
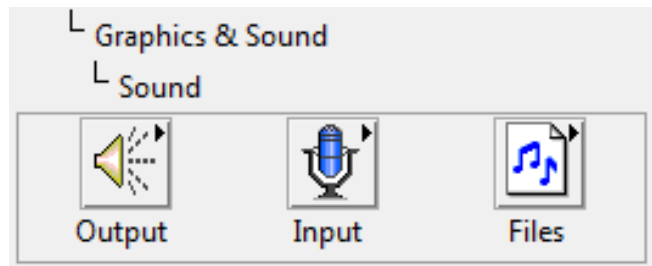
### Play Sound File.vi



Opens a file and starts playing it immediately.

# Grafika i dźwięk w LabView



## Programming/Graphics and Sound/Sound




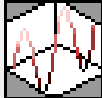
# Grafika i dźwięk w LabView

Graphics & Sound



3D Graph Properties



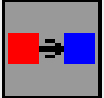
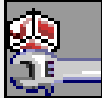
3D Surface.vi    3D Parametri...




3D Curve.vi    Basic Propert...



Axes Properti...    Grid Properti...

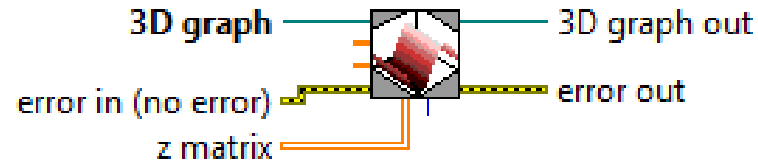


Projection Pr...    Convert OLE ...



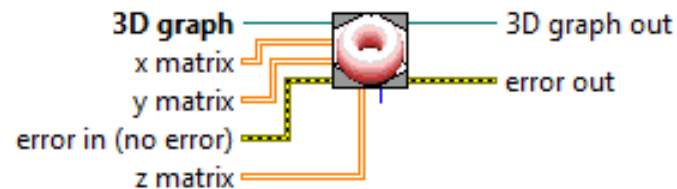
Set Plots.vi

## 3D Surface.vi



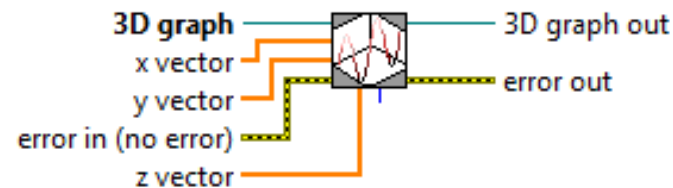
Plots a simple surface from **z matrix**.

## 3D Parametric Surface.vi



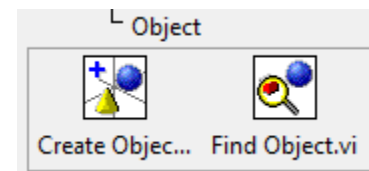
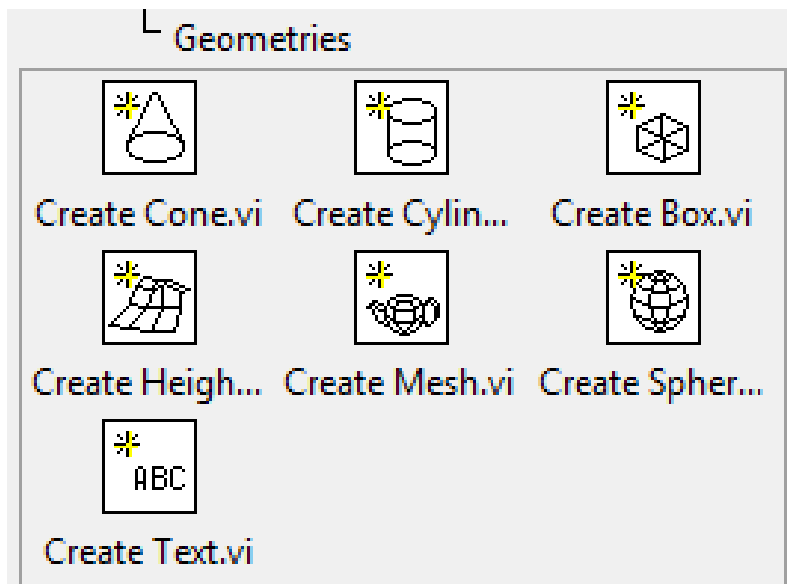
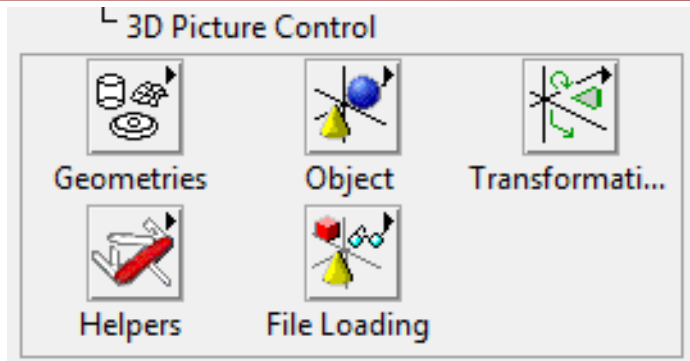
Plots a surface in terms of *x*, *y*, and *z* surfaces. The VI has three 2D array or matrix inputs that specify each of the *x*, *y*, and *z* planes.

## 3D Curve.vi

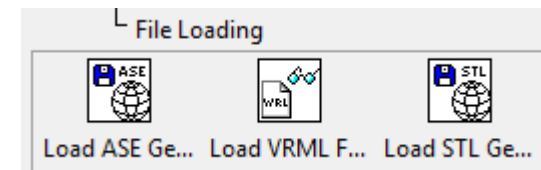
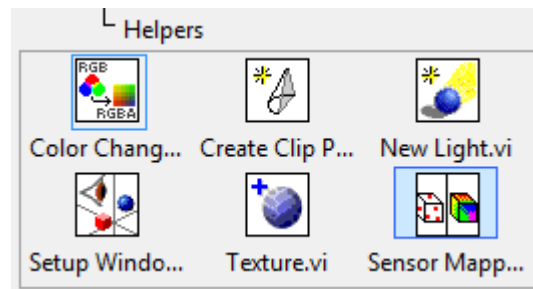
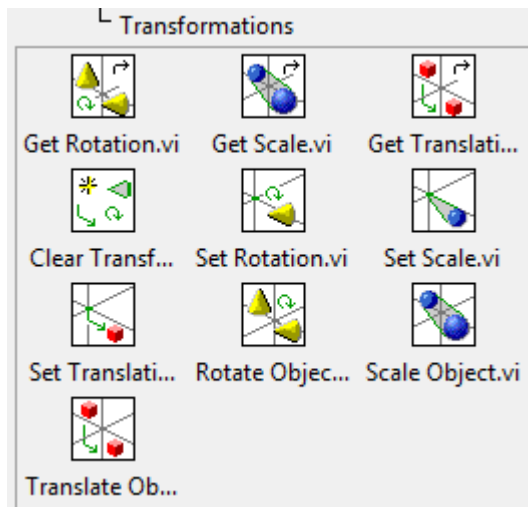
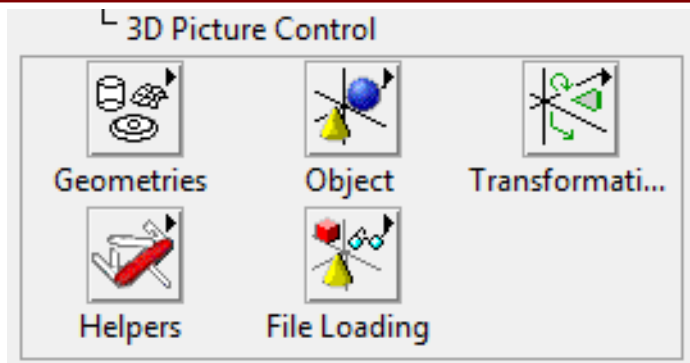


Describes a line in terms of *x*, *y*, and *z* points. This VI has three 1D array or vector inputs that specify each point in the plot.

# Grafika i dźwięk w LabView

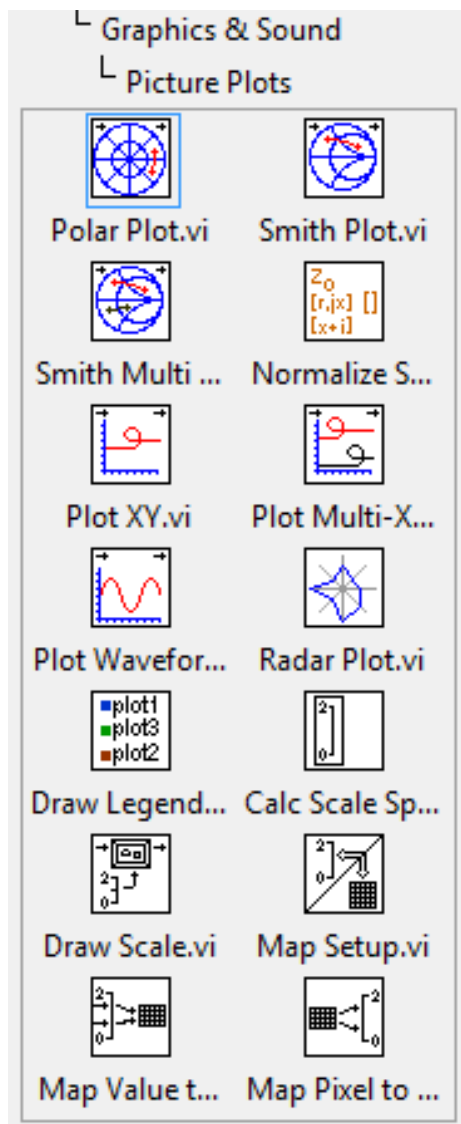


# Grafika i dźwięk w LabView

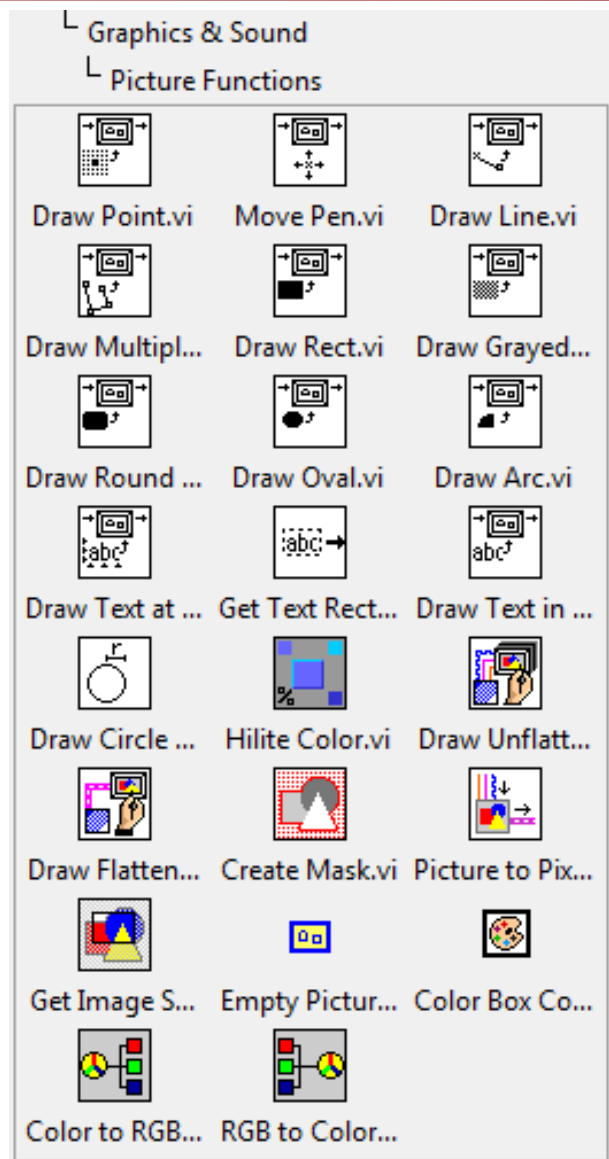




# Grafika i dźwięk w LabView



# Grafika i dźwięk w LabView



# Grafika i dźwięk w LabView

- **Picture Functions VIs (nie w Base Package)**

- np.

**Color to RGB** – rozdziela kolor wejściowy na komponenty RGB

**Create Mask** – tworzy maskę

**Draw Arc** – rysuje łuk

**Draw Circle by Radius** – rysuje okrąg o określonym promieniu

**Draw Line** – rysuje linię

**Draw Multiple Lines** – wiele połączonych linii

**Draw Point** – rysuje punkt (pixel) w określonym kolorze

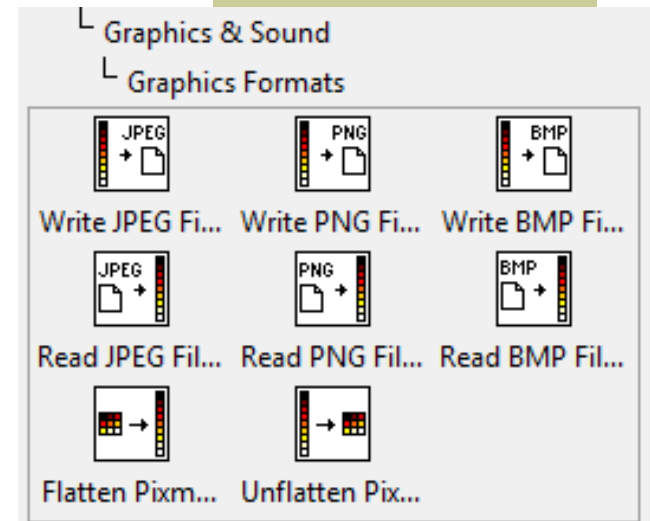
**Draw Rect** – rysuje prostokąt

**Draw Text at Point** – rysuje tekst

**Draw Unflattened Pixmap** - konwertuje „pixmap” w rysunek

**Empty Picture** – pusty rysunek

# Grafika i dźwięk w LabView



## ■ Graphics Formats VIs (nie w Base Package)

**Flatten Pixmap** – konwersja danych „pixmap” z tablicy 2D do 1D

**Read BMP File** – czyta pliki BMP i „przygotowuje dane do wyświetlenia

**Read JPEG File**

**Read PNG**

**Unflatten Pixmap** – konwersja klastra „image data” do tablicy 2D

**Write BMP File** – zapisuje w formacie BMP

**Write JPEG File**

**Write PNG File**