

$$\int_{-1}^1 \frac{T_n(x)T_m(x)}{\sqrt{1-x^2}} dx = \begin{cases} 0 & m \neq n \\ \pi/2 & m = n \neq 0 \\ \pi & m = n = 0 \end{cases}.$$

References

Abramowitz, M., and I.A. Stegun, *Handbook of Mathematical Functions*, 446 pp., Dover, New York, 1972.

See Also

chebyshevU.

chebyshevU

chebyshevU (*n*, *x*)

The **chebyshevU** function returns the Chebyshev polynomial of the second kind, degree *n* and argument *x*.

The Chebyshev polynomial of the second kind satisfies the recurrence relation

$$U(n+1, x) = 2xU(n, x) - U(n-1, x)$$

which is also the recurrence relation of the Chebyshev polynomials of the first kind.

The first 10 polynomials of the second kind are:

$$U(0, x) = 1$$

$$U(1, x) = 2x$$

$$U(2, x) = 4x^2 - 1$$

$$U(3, x) = 8x^3 - 4x$$

$$U(4, x) = 16x^4 - 12x^2 + 1$$

$$U(5, x) = 32x^5 - 32x^3 + 6x$$

$$U(6, x) = 64x^6 - 80x^4 + 24x^2 - 1$$

$$U(7, x) = 128x^7 - 192x^5 + 80x^3 - 8x$$

$$U(8, x) = 256x^8 - 448x^6 + 240x^4 - 40x^2 + 1$$

$$U(9, x) = 512x^9 - 1024x^7 + 672x^5 - 160x^3 + 10x$$

See Also

The **chebyshev** function.

CheckBox

CheckBox [/Z] *ctrlName* [*keyword* = *value* [, *keyword* = *value* ...]]

The **CheckBox** operation creates or modifies a checkbox, radio button or disclosure triangle in the target or named window, which must be a graph or control panel.

ctrlName is the name of the checkbox.

For information about the state or status of the control, use the **ControlInfo** operation.

Parameters

ctrlName is the name of the **CheckBox** control to be created or changed.

The following keyword=value parameters are supported:

align=*alignment*

Sets the alignment mode of the control. The alignment mode controls the interpretation of the *leftOrRight* parameter to the *pos* keyword. The *align* keyword was added in Igor Pro 8.00.

If *alignment*=0 (default), *leftOrRight* specifies the position of the left end of the control and the left end position remains fixed if the control size is changed.

If *alignment*=1, *leftOrRight* specifies the position of the right end of the control and the right end position remains fixed if the control size is changed.

appearance= { <i>kind</i> [, <i>platform</i>]}	<p>Sets the appearance of the control. <i>platform</i> is optional. Both parameters are names, not strings.</p> <p><i>kind</i> can be one of <code>default</code>, <code>native</code>, or <code>os9</code>.</p> <p><i>platform</i> can be one of <code>Mac</code>, <code>Win</code>, or <code>All</code>.</p> <p>See Button and DefaultGUIControls for more appearance details.</p>
disable= <i>d</i>	<p>Sets user editability of the control.</p> <p><i>d</i>=0: Normal.</p> <p><i>d</i>=1: Hide.</p> <p><i>d</i>=2: Disable user input.</p>
fsize= <i>s</i>	Sets font size for checkbox.
fColor=(<i>r,g,b[,a]</i>)	<p>Sets the initial color of the title. <i>r</i>, <i>g</i>, <i>b</i>, and <i>a</i> specify the color and optional opacity as RGBA Values. The default is opaque black.</p> <p>To further change the color of the title text, use escape sequences as described for <code>title=titleStr</code>.</p>
focusRing= <i>fr</i>	<p>Enables or disables the drawing of a rectangle indicating keyboard focus:</p> <p><i>fr</i>=0: Focus rectangle will not be drawn.</p> <p><i>fr</i>=1: Focus rectangle will be drawn (default).</p> <p>On Macintosh, regardless of this setting, the focus ring appears if you have enabled full keyboard access via the Shortcuts tab of the Keyboard system preferences.</p>
help={ <i>helpStr</i> }	<p>Sets the help for the control.</p> <p><i>helpStr</i> is limited to 1970 bytes (255 in Igor Pro 8 and before).</p> <p>You can insert a line break by putting “\r” in a quoted string.</p>
mode= <i>m</i>	<p>Specifies checkbox appearance.</p> <p><i>m</i>=0: Default checkbox appearance.</p> <p><i>m</i>=1: Display as a radio button control.</p> <p><i>m</i>=2: Display as a disclosure triangle (<i>Macintosh</i>) or treeview expansion node (<i>Windows</i>).</p>
noproc	Specifies that no procedure is to execute when clicking the checkbox.
picture= <i> pict</i>	<p>Draws the checkbox using the named picture. The picture is taken to be six side-by-side frames which show the control appearance in the normal state, when the mouse is down, and in the disabled state. The first three frames are used when the checked state is false and the next three show the true state. The picture may be either a global (imported) picture or a Proc Picture (see Proc Pictures on page IV-56).</p>
pos={ <i>leftOrRight,top</i> }	<p>Sets the position in Control Panel Units of the top/left corner of the control if its alignment mode is 0 or the top/right corner of the control if its alignment mode is 1. See the align keyword above for details.</p>
pos+={ <i>dx,dy</i> }	Offsets the position of the checkbox in Control Panel Units .
proc= <i>procName</i>	Specifies the procedure to execute when the checkbox is clicked.
rename= <i>newName</i>	Renames the checkbox to <i>newName</i> .
side= <i>s</i>	<p>Sets the location of the title relative to the box:</p> <p><i>s</i> =0: Checkbox is on the left, title is on the right (default).</p> <p><i>s</i> =1: Checkbox is on the right, title is on the left.</p>

CheckBox

<code>size={width,height}</code>	Sets checkbox size in Control Panel Units .
<code>title=titleStr</code>	Sets title of checkbox to the specified string expression. The title is the text that appears in the checkbox. If not given or if "" then the title will be "New". Using escape codes you can change the font, size, style, and color of the title. See Annotation Escape Codes on page III-53 or details.
<code>userdata(UDName)=UDStr</code>	Sets the unnamed user data to <i>UDStr</i> . Use the optional (<i>UDName</i>) to specify a named user data to create.
<code>userdata(UDName)+=UDStr</code>	Appends <i>UDStr</i> to the current unnamed user data. Use the optional (<i>UDName</i>) to append to the named <i>UDStr</i> .
<code>value=v</code>	Specifies whether the checkbox is selected (<i>v</i> =1) or not (<i>v</i> =0).
<code>variable=varName</code>	Specifies a global numeric variable to be set to the current state of a checkbox whenever it is clicked or when it is set by the value parameter. The variable is two-way: setting the variable also changes the state of the checkbox.
<code>wave=waveName</code>	Specifies a point from a wave to be set to the current state of a checkbox when it is clicked or when it is set by the value keyword. The point is specified using standard bracket notation with either a numeric point number or a row label, e.g., <code>value=awave[4]</code> or <code>value=awave[%alabel]</code> . You may also use a 2D, 3D, or 4D wave and specify a column, layer, and chunk index or dimension label in addition to the row index. This feature was added in Igor Pro 9.00.
<code>win=winName</code>	Specifies which window or subwindow contains the named control. If not given, then the top-most graph or panel window or subwindow is assumed. When identifying a subwindow with <i>winName</i> , see Subwindow Syntax on page III-92 for details on forming the window hierarchy.

Flags

`/Z` No error reporting.

Details

The target window must be a graph or panel.

Checkbox Action Procedure

The action procedure for a CheckBox control can take a predefined structure `WMCheckboxAction` as a parameter to the function:

```
Function ActionProcName(CB_Struct) : CheckBoxControl
    STRUCT WMCheckboxAction &CB_Struct
    ...
    return 0
End
```

The "`: CheckBoxControl`" designation tells Igor to include this procedure in the Procedure pop-up menu in the Checkbox Control dialog.

See **WMCheckboxAction** for details on the `WMCheckboxAction` structure.

Although the return value is not currently used, action procedures should always return zero.

You may see an old format checkbox action procedure in old code:

```
Function procName(ctrlName,checked) : CheckBoxControl
    String ctrlName
    Variable checked // 1 if selected, 0 if not
    ...
    return 0
End
```

This old format should not be used in new code.

When using radio button controls, it is the responsibility of the Igor programmer to turn off other radio buttons when one of a group of radio buttons is pressed.