



Chapter 27

Animation

This chapter describes how to use Mathcad to create and play short animation clips by using the built-in variable FRAME. Anything that can be made to depend on this variable can be animated. This includes not only plots but numerical results as well. You can play back the animation clips at different speeds or save them for use by other applications.

The following sections make up this chapter:

Creating an animation clip

How to use the FRAME variable to create a sequence of images and how to string this sequence together into a movie.

Playing an animation clip

Using Mathcad's animation player to play back your movie. Embedding animations in your worksheet.

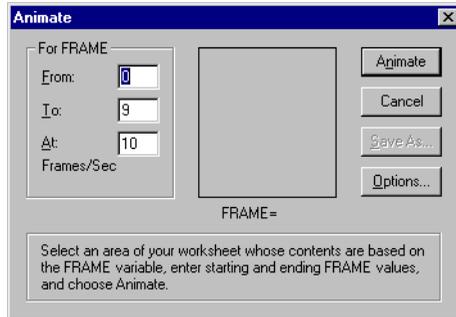
Gallery of animations

A collection of examples showing what you can do with animation.

Creating an animation clip

Mathcad comes with a predefined constant called FRAME whose sole purpose is to drive animations. The steps in creating any animation are as follows:

- Create an expression or plot whose appearance ultimately depends on the value of FRAME as shown in Figure 27-1. This expression need not be a graph as shown. It can be anything at all.
- Choose **Animate** from the **View** menu to bring up the following dialog box.



- Select the portion of your worksheet you want to animate as shown in Figure 27-2.
- In the dialog box, set the upper and lower limits for FRAME. The FRAME variable will increment by one as it proceeds from the lower limit to the upper limit.
- In the Frames/Sec. text box, enter the playback speed.
- Click the “Animate” button in the dialog box. You'll see a miniature rendition of your selection inside the dialog box as shown in Figure 27-3. Mathcad redraws this once for each value of FRAME. This won't necessarily match the playback speed since at this point, you're just *creating* the animation, you're not yet playing it back.

At this point, an animation has been created. You can now do one of two things with it:

- You can save it as a Windows AVI file for use by other Windows applications.
- You can play it back immediately.

To save your animation clip as a Windows AVI file, click the Save As button in the dialog box. You'll see the usual Save As dialog box. Since animation clips tend to take considerable disk space, Mathcad saves them in compressed format. Before creating the animation, you may want to choose what compression method to use or whether to compress at all. To do so, click on the Options button.

To play the animation sequence back, follow the instructions in the next section.

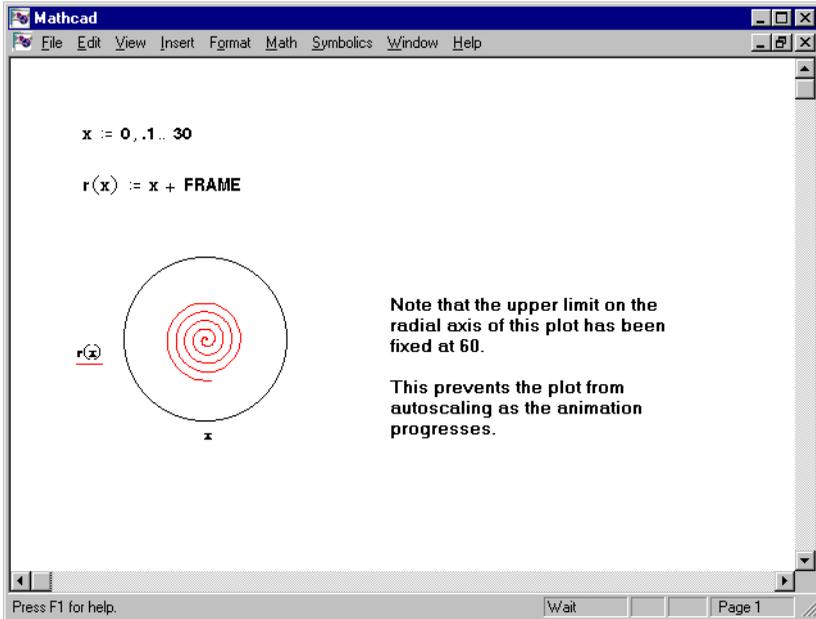


Figure 27-1: An expression suitable for animation. Note the dependence of the plot on FRAME.

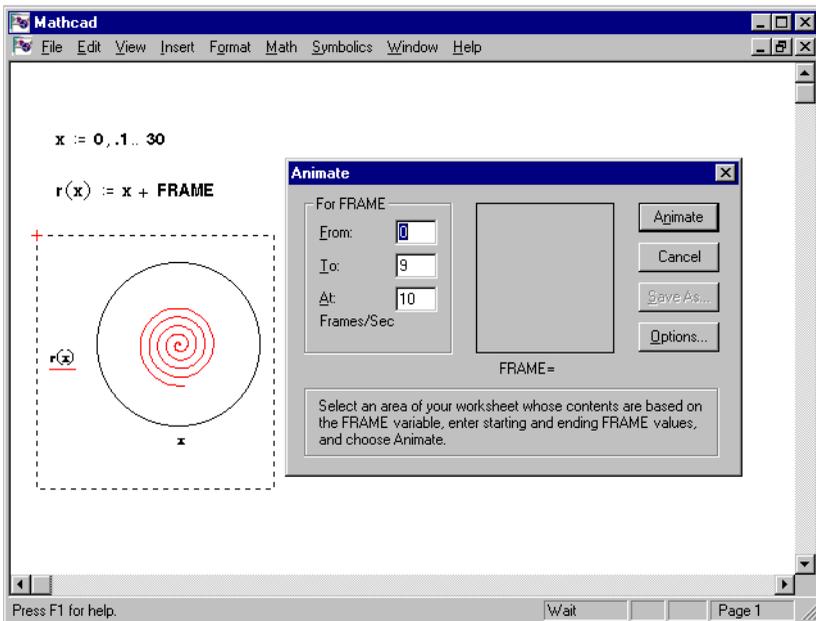


Figure 27-2: The region to be animated has been selected.

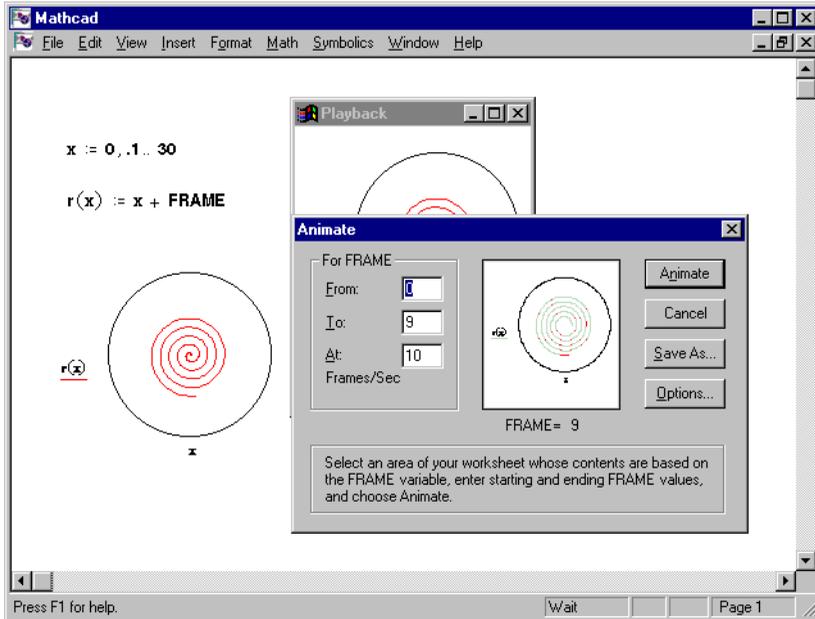
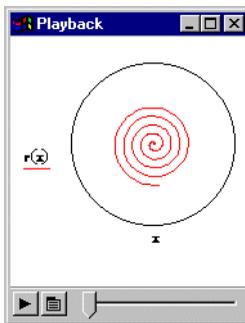


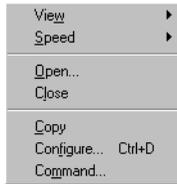
Figure 27-3: The animation clip has been created and is ready for playback.

Playing an animation clip

As soon as you've created an animation clip as described in the previous section, Mathcad brings up the following window:



Note that the first frame of the animation clip you just created is already in the window. To play back the animation clip, click on the arrow button at the lower left corner of the window. The arrow will turn into a square and the animation will begin to play. You can control the playback speed by clicking on the button to the right of the play button, which then displays the context menu shown below:



Choose **Speed** from the menu and adjust the slider control.

You can also play back the animation clip on a frame by frame basis, either forward or backward. To do so, drag the slider below the animated picture to the left or right.

You can resize this window the way you would any window, by dragging a corner in the appropriate direction. Keep in mind, however, that the image in the window is a bitmap and therefore subject to distortion when resized. You can minimize this distortion by keeping the aspect ratio (height to width) constant when you resize. To do this conveniently, click on the button to the right of the play button and choose **View** from the context menu.

Playing a previously saved animation

If you have an existing Windows AVI file on your disk, you'll be able to play it within Mathcad. To do so:

- Choose **Playback** from the **View** menu to bring up the following dialog box:



The window is collapsed shut since no animation clip has been opened. To open one, click on the button to the right of the play button and choose **Open** from the menu. You'll see an Open File dialog box which you can use to locate and open the Windows AVI file you want to play.

Once you've loaded a Windows AVI file, you can proceed as described in the previous section.

Launching an animation directly from your worksheet

Once you have created an animation, you may want to launch it directly from your worksheet without having to choose **Playback** from the **View** menu, as described above. You may also wish to embed it or link it directly to your worksheet so that it can be played "in place."

Here are three ways to associate a particular animation file with your worksheet:

- Insert a hyperlink in your worksheet to an AVI file by choosing **Hyperlink** from the **Insert** menu. You may attach the hyperlink to a plot, a graphic, a text region, or any other region in the worksheet, and the AVI file you link to may be located on a local or network disk drive or on the Internet. Once you have specified an AVI file as the target of the hyperlink, you launch it simply by double-clicking on the

hyperlink in the worksheet. The AVI file then plays in its own window. See Chapter 4, “Worksheet Management,” for information about creating hyperlinks.

- Create a *shortcut* to the AVI file in your worksheet by dragging the icon for the AVI file from the Windows Explorer and dropping it into your worksheet at a blank space where you want the animation to appear. The first frame of the animation will appear as a picture in your worksheet. To activate the shortcut, click on the picture of the first frame and click on the play button that appears at the bottom of the picture. Although the AVI file remains external to your Mathcad worksheet, it plays in place in your worksheet. See Figure 27-4 for an example.
- Embed or link an OLE object in your worksheet by choosing **Object** from the **Insert** menu and selecting “Video Clip” from the list in the Insert Object dialog box. See Chapter 4, “Worksheet Management,” for details about embedding versus linking OLE objects in Mathcad worksheets and how to edit OLE objects in place.

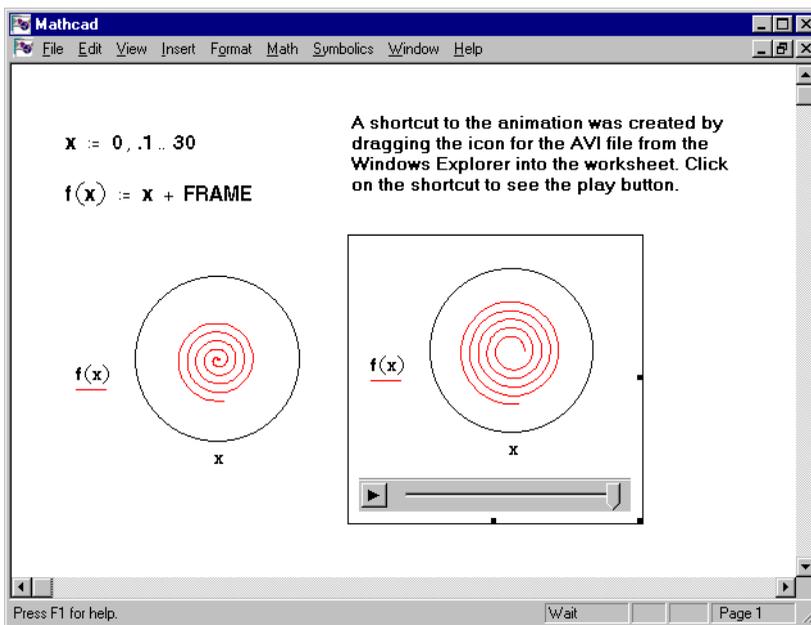


Figure 27-4: A Mathcad worksheet containing a shortcut to an animation.

Gallery of animations

The following figures show some of the things you can do with animation using Mathcad's different plot types (polar, X-Y, 3D scatter, vector field, parametric surface, bar, and contour). Choose **Resource Center** from the **Help** menu and look for “Animations” in the QuickSheets to see some more.

Note that since Mathcad's plots autoscale by default, you'll almost always have to change the plot format to show the animation you want. For example, when animating an X-Y plot or a polar plot you should enter values into the axis limit placeholders to fix the extent of each axis and preserve the plot scaling throughout the course of the animation. Similarly, when an animation involves a 3D plot, you should fix the axis limits by double-clicking on the plot to bring up the 3D Plot Format dialog box, unchecking Autoscale on the Axes page, and setting the axis limit on each axis in such a way that all points generated in the course of the animation are within the axis limits.

In the examples in this chapter, Figure 27-1 has a maximum radius in the placeholder for the radial axis limit; Figure 27-7 and Figure 27-9 have autoscale turned off on all axes and appropriate limits entered.

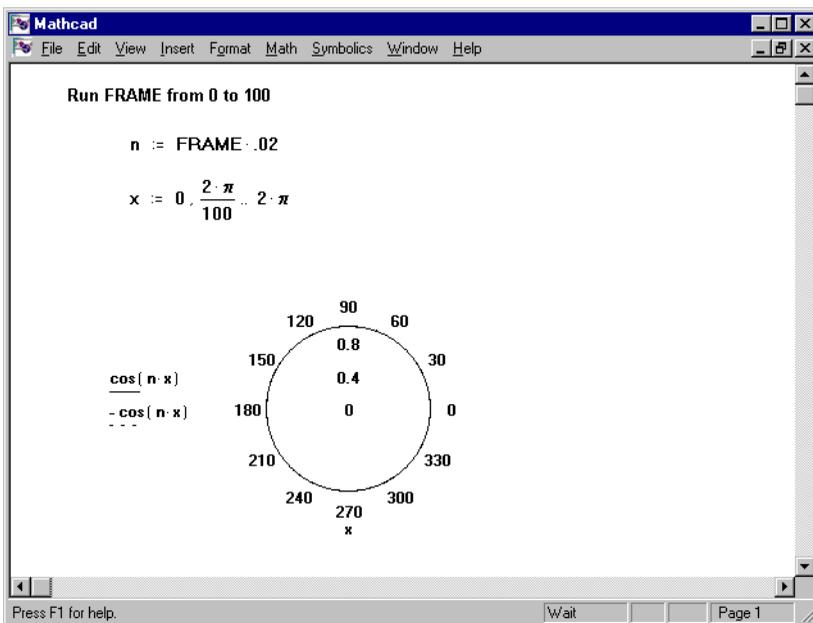


Figure 27-5: Growing a four-leaf clover.

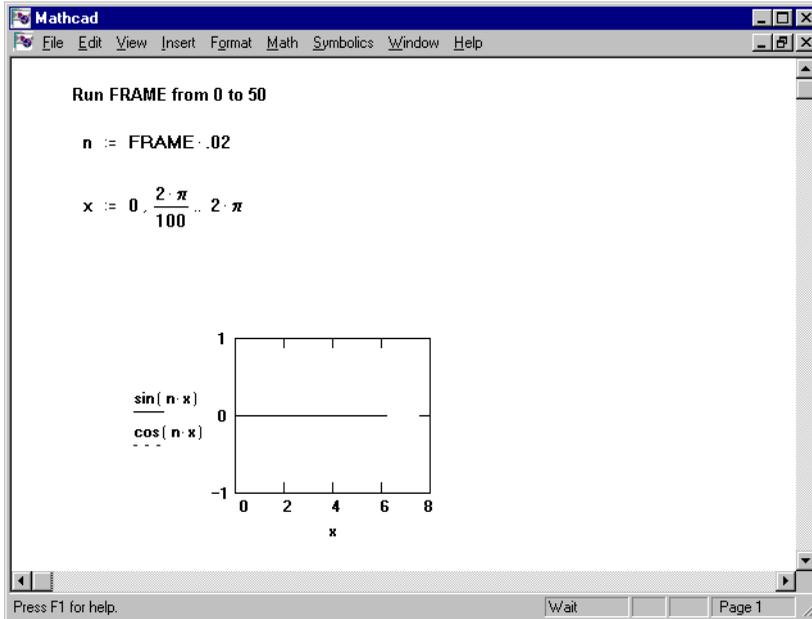


Figure 27-6: Roller coaster.

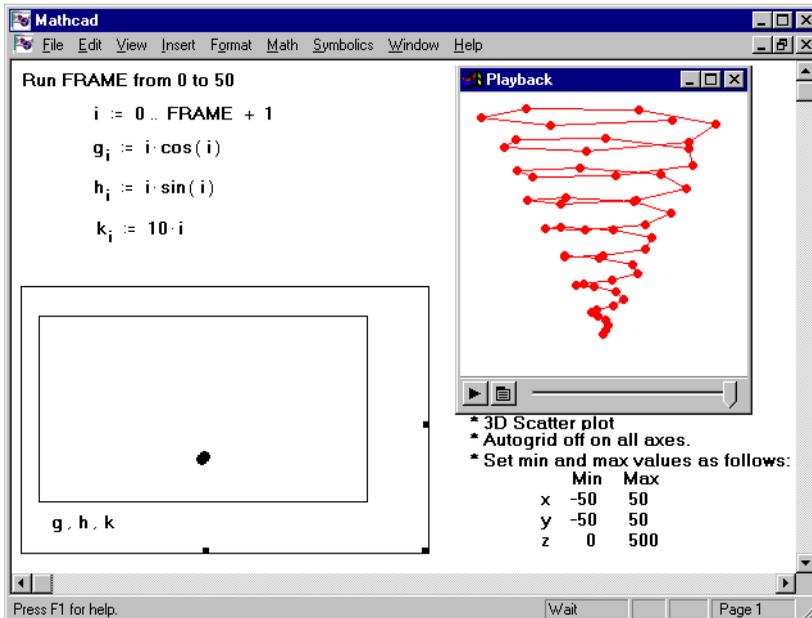


Figure 27-7: Tornado.

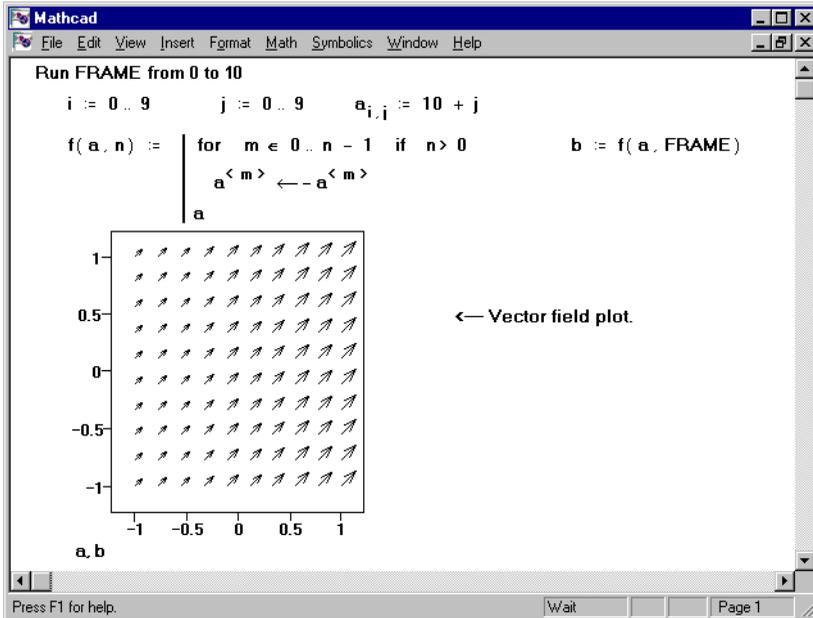


Figure 27-8: Diffusion of one field across another.

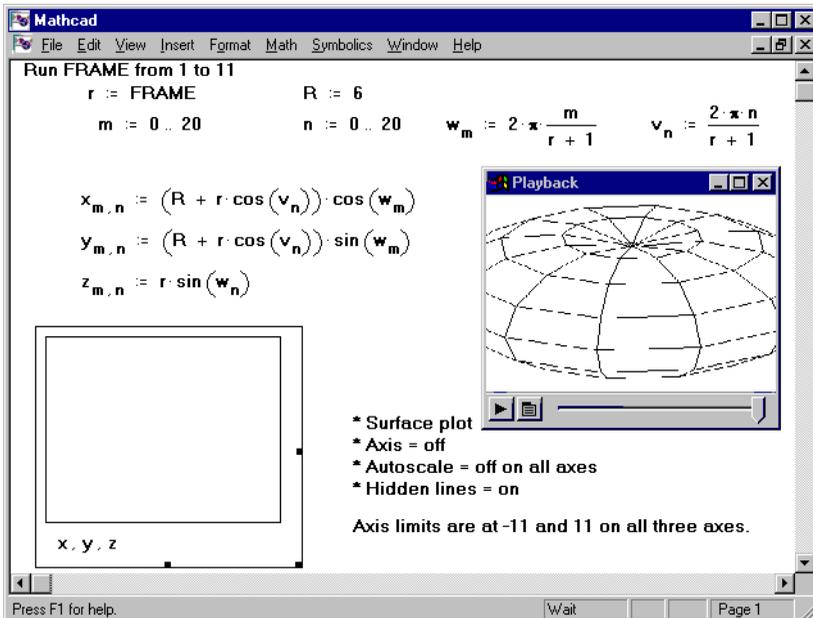


Figure 27-9: Nested spheroids.

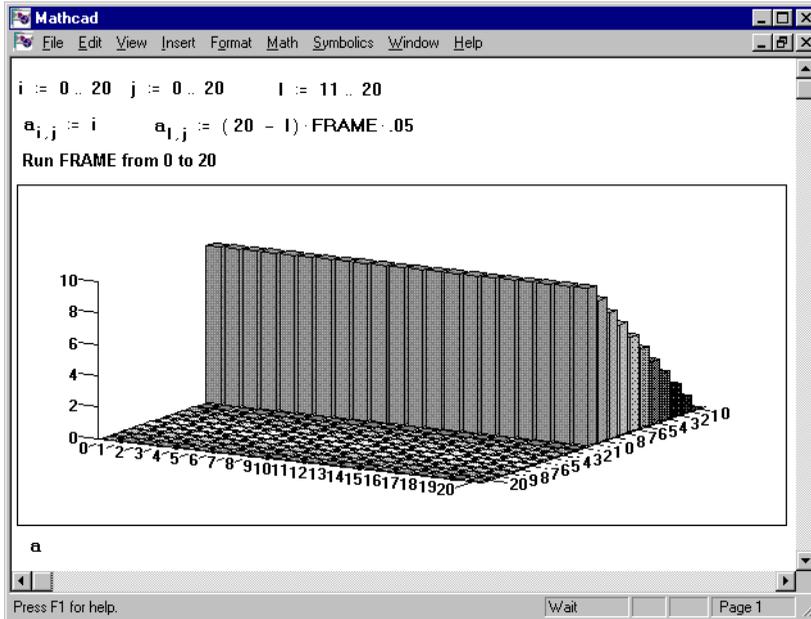


Figure 27-10: Barn raising. This one may take a few minutes.

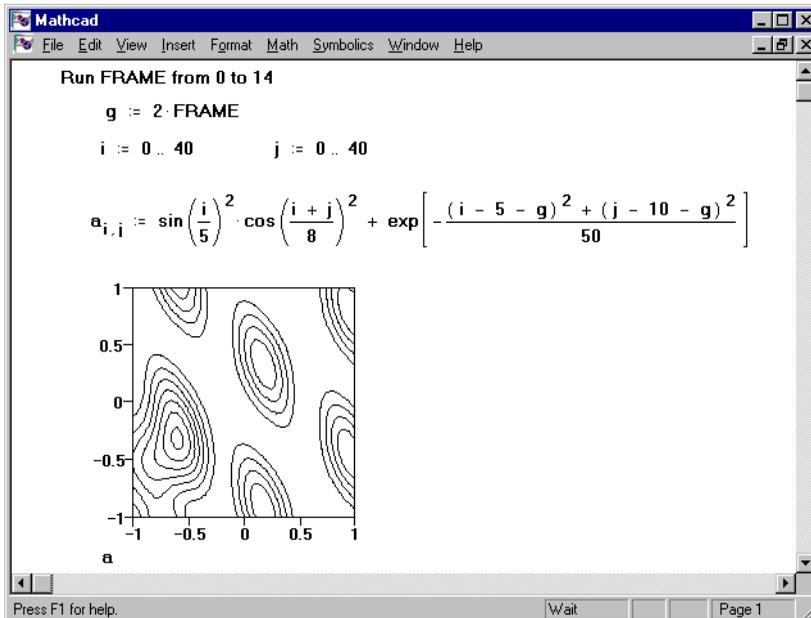


Figure 27-11: Animated contour map. This one may take a few minutes.