#[1]+[2]$[3] Winfract (Fractint for Windows)

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[1]# main_index
[2]+ browse:005
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What's New in this Release?

This release of Winfract is essentially the same as the version 17.50 that was included in the book "Fractals for Windows", but with the following enhancements:

- The core fractal engine in this release is from Fractint 18.2.   All fractal types from Fractint 18.2 (with the exception of the 'julia_inverse' fractal type, which requires some extra logic we haven't yet added to Winfract) have been incorporated into this version of Winfract.

- The File Open, File SaveAs, and File Print options now use the new Windows-style "common dialog boxes", with the extra capabilities provided by those routines.   This is particularly handy if you're using Windows-for-Workgroups or Windows NT with their networking options.

Despite the ridiculously long interval (2 1/2 months) between the release of Fractint 18.2 and this release of Winfract, this *is* a rushed release (long story involving "real work" deleted for lack of interest).   As a result, it very likely has a number of silly bugs in it that could be easily squashed if we'd only taken (or had the time to take) a reasonable review of the program before unleashing it on you, the unsuspecting public.   You can get your revenge, however, by reporting those bugs to Bert Tyler - see the <u>list of Authors</u> for his email address or <u>Contacting the Authors</u>   for alternate ways to reach him.

4[#] `whatsnew_index`
5[$] What's New in this Release?
6⁺ browse:007
7^K Fractint Prompts;Fractint Help;Fractint Hotkeys

Fractint-Style Help and Prompts

Fractint's hypertext-like online help (all 350+ screens' worth!) is available at the push of a button (specifically, the Control-F1 button - the F1 button brings up this Winfract-specific help system). Note that Fractint's online help is just that - Fractint-specific online help.   While much of that help is common to both Fractint and Winfract, some of it (the sections on printing, the palette editor, and the 'V(iew)' options come to mind right away) describe items that have nothing to do with the Winfract environment.   Also, Fractint's online help is not context-sensitive at the moment - you always start at Fractint's initial help index screen when you press Control-F1.

Many Fractint-style hot-keys are also available.   Depending on the status of the "Hot-key Actions" option (found in the "Options" menuitem), these hot-keys will either take you directly to the appropriate Winfract menu or to a text-based prompting screen directly from Fractint.   Note that some functions (printing and selecting video modes are prime examples) are so different between the DOS and Windows environments that you will be taken to a Windows-style menu even if you've selected Fractint-style prompts.

The Fractint-style "Hot-Keys" and their actions are listed below.   Items marked with a "*" are not connected to a Fractint-style prompting screen and will always take you directly to a Windows-style equivalent.

T	Select Fractal Type
S	Save Fractal Image *
P	Print Fractal Image *
R	Restore Fractal Image
3	3D Restore
O	3D Overlay
X	Basic Options
Y	Extended Doodads
Z	Fractal Parameters
I	3D Parameters
A	Starfields
@	Select Parameter file and item
B	Save Parameter item
L	Load Color-Map
W	Write (save) Color-Map *
DEL	Select Image Size *
INS	Reset All Options
TAB	Status display

In addition to the above, Winfract also responds to many of the Fractint-style color-cycling hot-keys: 'C', '+', '-', '<', '>', the four cursor keys, SPACE, and ENTER.   Unlike Fractint, you don't have to enter "color-cycling mode" to use these keys - Color-Cycling mode and the main image mode are one and the same.

Many of Fractint's prompting screens have been also incorporated into Winfract.   Note that some of these screens list options that aren't connected to anything in the Winfract environment (the sound options on the 'X' screen come to mind).   However, those of you who are used to Fractint's prompting screens may find this option more comfortable than the Windows menus.

8# fractint_index
9$ Fractint-Style Help and Prompts
10+ browse:050
11K Fractint Prompts;Fractint Help;Fractint Hotkeys

Currently, these Fractint-style prompting screens are only selectable using the Hot-Keys (using the Windows menu-bars always gives you Windows-style entry screens), and then only if you have chosen "Fractint-style Prompts" as your "Hot-Key Options" default.

#[12]$[13]+[14]K[15]
Limitations in Winfract

Fractint for Windows is (and will continue to be) a "port" of Fractint for DOS to the Windows environment, retaining the Fractint for DOS fractal and GIF engines, but replacing its front-end and graphics interface with a Windows engine.   As such, its fractal engine will always "trail" that of Fractint for DOS (although hopefully not by much - the two 17.1 versions were uploaded within hours of each other), and the user interface will tend to do the same except where the Windows version adds functionality simply by virtue of the Windows interface.

There are three main causes behind the various limitations of this program.   For future brevity, these causes are tagged FFD (problems related to the fact that much of the code is and will continue to be from Fractint For Dos), WLIM (limitations caused by Windows, or some Windows video/printer drivers that aren't limitations under MS-DOS), and NYI (Not Yet Implemented - hey, we're working on it!).   We used to hide behind a fourth excuse - calling ourselves novice Windows programmers and using the "what can you expect?" claim - but folks quit believing that one.   FFD and WLIM limitations are probably permanent - hopefully NYI problems are less so.

At any rate, the major limitations of Winfract continue to be:

- You can run only one "instance" of Fractint for Windows.   FFD: Fractint for DOS is riddled with initialized FAR data ("char far myvalue = 0;"), and the Windows SDK silently but firmly tags any program containing code like that as a single-instance program.

- Palette support is limited.   WLIM: The "stock" VGA driver supplied with Win 3.0 doesn't support palette-modification by applications at all (most third-party 256-color SuperVGA drivers do, though).   "Plasma Clouds" look Godawful using anything less than a 256-color Windows driver.   Color-cycling is limited to video drivers which support palette-manipulation (and, for 16-color drivers, color-cycling affects the background windows as well).   Note that 16-bit and 24-bit "true color" Windows video drivers don't *have* a palette to manipulate, so we can't color-cycle them.

- Fractint for Windows is not as "background process" friendly as it should be when it updates the screen image - if it is updating a large image in its entirety, it can grab the machine for seconds at a time.   FFD   and WLIM -   Windows only gives other programs a shot at the CPU when the currently active program volunteers to give up control, and the fractal engine that Winfract is based on only gives us the opportunity to do that when it calls the routine that checks the keyboard - an event that may happen only once a second or so.

#[16]$[17]+[18]K[19]
File Menu

File **Open** loads either Fractint-for-DOS-style or "generic" GIF files.   Note that the correct palette isn't completely displayed on the screen.   Windows "reserves" twenty palette values for its own use, and "adjusts" Fractint's images accordingly - and for 16-color drivers like the VGA driver supplied with Windows that don't support palette-manipulation by applications programs, cheerfully ignores our attempts at palette-manipulation.   If the restored image is resumable , the image will resume calculating as soon as it is loaded.

File **Save** saves your current image (by default, as a GIF (version 89a) file, compatible with Fractint-for-DOS, your favorite DOS GIF viewers, and (of course) the "File Open" option, but optionally as a BMP file).   Again, the palette you see on the screen may not be the one that the program is "using" (and gets saved to the disk file).   If the saved image is resumable , the image will resume calculating as soon as it is finished saving.   Note that Winfract can only open GIF89a-format images as fractal images, and cannot open BMP-format images at all.

File **3D Open** and File **3D Overlay** load in your image using "3D" transformations.   The 3D Open option clears your image first and then loads the new one, while the Overlay option leaves your original image intact and adds the new image over it.

File **Print** does the best job it can sending the image to your printer.   The program does not "dither" for black-and-white printers - it just "candy stripes" adjacent colors the same way that Fractint-for-DOS does.

Read Batchfile and **Write Batchfile** load and save "batch-file" parameters of your (and others) favorite images.   As soon as you Read a batchfile image (saved as an entry in a PAR file such as FRACTINT.PAR), Winfract will begin generating that image at whatever image size you are currently using.   The disadvantage to saving your favorite images as PARameter files rather than GIF images is that Winfract has to recreate each image every time you select it.   The advantage is that you can fit a lot more formulas on your hard disk this way, and they're a tad easier to E-mail to your friends!

File **Copy to Clipboard** copies the currently-displayed image to the Windows clipboard (in "Device-Independent Bitmap" format) where your other Windows programs can collect it.   Note that, for 256-color video drivers and 256-color images, the colors in the clipboard won't visibly match the colors in Winfract's window until you change your "focus" to the clipboard's window. That's because Winfract has warned the Clipboard that it is reserving the right to color-cycle its colors, so the Clipboard is just using Windows' default 20 colors to display its colors while Winfract has control of the screen.

GIF and "Graphics Interchange Format" are trademarks of CompuServe Incorporated, an H&R Block Company.

16# file_index
17$ File Commands
18+ browse:010
19K file;open;save;print;gif;bmp;3d;3d overlay;parameter files

Fractals Options

Fractal Formula brings up a dialog box letting you select from any of approximately 80 fractal types.   See the <u>Fractal Formula Selection</u> for formula details.

Basic Options brings up a "Basic Options" menu that lets you select any of what we consider the "basic" (mostly because we added them first) fractal options - various generation algorithms (single/dual pass, solid-guessing, boundary tracing, tesseral),   inside and outside coloring schemes, maximum iterations,   Biomorph and Decomposition options, etc .

Extended Options brings up an "Extended Options" menu that lets you select any of what we consider to be "extended" (because we didn't think of them until later) fractal options, including Inversion and Continuous Potential.

Fractal Params brings up a "Fractal Parameters" menu that lets you select any modifiable parameters in your fractal type as well as the specific area you may want to zoom in on.

3D Params brings up a "3D Parameters" menu that lets you select any modifiable 3D parameters in your fractal type.

Reset all Options resets all fractal-related options to the default state they were in when Winfract was first started.

Once you have selected any of these options, Winfract will clear the image and regenerate it using the new options you have given it.

View Options

Image Settings The **Image Settings** option lets you select either a pre-defined image size, or make up your own (up to an internal limit of 2048x2048) and select a two-color, 16-color, or 256-color image.   Those of you with 24-bit color video cards will have to hold yourself back to 256-color images for the moment - the 256-color limit is one of the penalties of using the fractal engine from Fractint.

If your image size is larger than your window, you can use the scroll bars in the window to scroll around your image.

If you have selected the "Window Sizing" option (see below), your image window will automatically re-size to the image size you have just selected.

Zoom In, **Zoom Out**, and **Zoom Bar** toggles select which of three zooming options you want to use.   For details, see the help section on Zooming in on an Image.

Coordinate Box toggles the display of an optional "Coordinate Box" displaying information about the pixel directly underneath your mouse pointer.   See the help section under Coordinate Box for details.

Window Sizing toggles the "Window Sizing" option, in which the scroll-bars are eliminated and the image window is automatically sized to the size of your fractal image.

Pixel-By-Pixel Update toggles the "Pixel-By-Pixel Update" option, in which Winfract's normal method of updating its image in periodic chunks is changed to a "display every pixel as it is changed" strategy.   This approach is *extremely* slow (Windows' overhead takes a heavy toll on programs that update their images this way), but it lets you see how Winfract is actually generating its images - try this using the Boundary Trace and Tesseral image-generation methods.

HotKey Actions toggles whether the various "hot-keys" Winfract is sensitive to take you to the same Windows-style menus accessed through the Windows menubar or "Fractint-style" prompting screens.   See the help section on Fractint-Style Help and Prompts for details.

Status Brings up a Status messagebox displaying the status of your current image (which formula you are using, its parameters and screen corners, and whether or not it's still being generated or has finished).   If the image is still being generated, Winfract continues with it when you press the "OK" button.

24$^{\#}$ view_options
25$^{\$}$ View Options
26^{+} browse:020
27^{K} image size;zooming; zoom in;zoom out;zoom bar;image sizing;pixel-by-pixel updating;status report

Color Options

Load Color-Map and **Write Color-Map** load and save external color-maps in the same manner as Fractint-for-DOS (within Windows' limitations).

Color-Cycling brings up a Color_Cycling Dialog box.   See the Help section on <u>Color_Cycling</u> for details.

28[#] color_index
29[$] Color Options
30⁺ browse:025
31^K colormaps;color-cycling;loading colormaps;saving colormaps

Help Options

Index brings up this help system.   So does pressing the F1 key.

Using Help brings up the standard Windows "help on Help" system.

Fractint Help brings up Fractint-style help screens (all 350+ of them!)   So does pressing the Control-F1 key.   See the Help section on <u>Fractint-Style Help and Prompts</u> for details.

About Winfract brings up a standard "About Box".

32# help_index
33$ Help Options
34+ browse:030
35K help;fractint-style help;about

Fractal Formula Selection

Using the Options **Formula** option, you can select any of over 80 fractal types (virtually every fractal type that is available in version 18.2 of Fractint-for-DOS).   After selecting a fractal type, a dialogue box pops up and prompts you for any formula parameters and the screen corners (all with reasonable default values).

A partial list of Fractal types and their formulas included in this release ("partial" only because I haven't yet gotten off my duff and updated this list to include the new fractal types added in version 18.x - sorry about that):

barnsleyj1
>   z(0) = pixel;
>   z(n+1) = (z-1)*c if real(z) >= 0, else
>   z(n+1) = (z+1)*modulus(c)/c
>   Two parameters: real and imaginary parts of c

barnsleyj2
>   z(0) = pixel;
>   if real(z(n)) * imag(c) + real(c) * imag(z((n)) >= 0
>   z(n+1) = (z(n)-1)*c
>   else
>   z(n+1) = (z(n)+1)*c
>   Two parameters: real and imaginary parts of c

barnsleyj3
>   z(0) = pixel;
>   if real(z(n) > 0 then z(n+1) = (real(z(n))^2 - imag(z(n))^2 - 1)
>   + i * (2*real(z((n)) * imag(z((n))) else
>   z(n+1) = (real(z(n))^2 - imag(z(n))^2 - 1 + real(c) * real(z(n))
>   + i * (2*real(z((n)) * imag(z((n)) + imag(c) * real(z(n))
>   Two parameters: real and imaginary parts of c.

barnsleym1
>   z(0) = c = pixel;
>   if real(z) >= 0 then
>   z(n+1) = (z-1)*c
>   else
>   z(n+1) = (z+1)*modulus(c)/c.
>   Parameters are perturbations of z(0)

barnsleym2
>   z(0) = c = pixel;
>   if real(z)*imag(c) + real(c)*imag(z) >= 0
>   z(n+1) = (z-1)*c
>   else
>   z(n+1) = (z+1)*c
>   Parameters are perturbations of z(0)

barnsleym3

z(0) = c = pixel;
if real(z(n) > 0 then z(n+1) = (real(z(n))^2 - imag(z(n))^2 - 1)
    + i * (2*real(z((n)) * imag(z((n))) else
z(n+1) = (real(z(n))^2 - imag(z(n))^2 - 1 + real(c) * real(z(n))
    + i * (2*real(z((n)) * imag(z((n)) + imag(c) * real(z(n))
Parameters are pertubations of z(0)

bifurcation

Pictoral representation of a population growth model.
Let P = new population, p = oldpopulation, r = growth rate
The model is: P = p +   r*p*(1-p).
Two parameters: Filter Cycles and Seed Population.

bif+sinpi

Bifurcation variation: model is: P = p + r*sin(PI*p).
Two parameters: Filter Cycles and Seed Population.

bif=sinpi

Bifurcation variation: model is: P = r*sin(PI*p).
Two parameters: Filter Cycles and Seed Population.

biflambda

Bifurcation variation: model is: P = r*p*(1-p)P.
Two parameters: Filter Cycles and Seed Population.

bifstewart

Bifurcation variation: model is: P = (r*p*p) - 1.
Two parameters: Filter Cycles and Seed Population.

Circle

Circle pattern by John Connett
x + iy = pixel
z = a*(x^2 + y^2)
c = integer part of z
color = c modulo(number of colors)

cmplxmarksjul

A generalization of the marksjulia fractal.
z(0) = pixel;
z(n+1) = (c^exp)*z(n) + c.
Four parameters: real and imaginary parts of c and exp.

cmplxmarksmand

A generalization of the marksmandel fractal.
z(0) = c = pixel;
z(n+1) = (c^exp)*z(n) + c.
Four parameters: real and imaginary parts of
perturbation of z(0) and exp.

complexnewton, complexbasin

Newton fractal types extended to complex degrees. Complexnewton
colors pixels according to the number of iterations required to
escape to a root. Complexbasin colors pixels according to which
root captures the orbit. The equation is based on the newton
formula for solving the equation z^p = r
z(0) = pixel;

z(n+1) = ((p - 1) * z(n)^p + r)/(p * z(n)^(p - 1)).
Four parameters: real & imaginary parts of degree p and root r

diffusion
Diffusion Limited Aggregation.   Randomly moving points
accumulate.   One parameter: border width (default 10)

fn+fn(pix)
c = z(0) = pixel;
z(n+1) = fn1(z) + p*fn2(c)
Six parameters: real and imaginary parts of the perturbation
of z(0) and factor p, and the functions fn1, and fn2.

fn(z*z)
z(0) = pixel;
z(n+1) = fn(z(n)*z(n))
One parameter: the function fn.

fn*fn
z(0) = pixel; z(n+1) = fn1(n)*fn2(n)
Two parameters: the functions fn1 and fn2.

fn*z+z
z(0) = pixel; z(n+1) = p1*fn(z(n))*z(n) + p2*z(n)
Six parameters: the real and imaginary components of
p1 and p2, and the functions fn1 and fn2.

fn+fn
z(0) = pixel;
z(n+1) = p1*fn1(z(n))+p2*fn2(z(n))
Six parameters: The real and imaginary components of
p1 and p2, and the functions fn1 and fn2.

formula
Formula interpreter - write your own formulas as text files!

gingerbread
Orbit in two dimensions defined by:
x(n+1) = 1 - y(n) + |x(n)|
y(n+1) = x(n)
Two parameters: initial values of x(0) and y(0).

henon
Orbit in two dimensions defined by:
x(n+1) = 1 + y(n) - a*x(n)*x(n)
y(n+1) = b*x(n)
Two parameters: a and b

Hopalong
Hopalong attractor by Barry Martin - orbit in two dimensions.
z(0) = y(0) = 0;
x(n+1) = y(n) - sign(x(n))*sqrt(abs(b*x(n)-c))
y(n+1) = a - x(n)
Parameters are a, b, and c.

IFS

Barnsley IFS fractals.

julfn+exp

A generalized Clifford Pickover fractal.
   $z(0)$ = pixel;
   $z(n+1)$ = fn($z(n)$) + e^$z(n)$ + c.
Three parameters: real & imaginary parts of c, and fn

julfn+zsqrd

   $z(0)$ = pixel;
   $z(n+1)$ = fn($z(n)$) + $z(n)^2$ + c
Three parameters: real & imaginary parts of c, and fn

julia

Classic Julia set fractal.
   $z(0)$ = pixel; $z(n+1)$ = $z(n)^2$ + c.
Two parameters: real and imaginary parts of c.

julia4

Fourth-power Julia set fractals, a special case
of julzpower kept for speed.
   $z(0)$ = pixel;
   $z(n+1)$ = $z(n)^4$ + c.
Two parameters: real and imaginary parts of c.

julibrot

'Julibrot' 4-dimensional fractals.

julzpower

   $z(0)$ = pixel;
   $z(n+1)$ = $z(n)^m$ + c.
Three parameters: real & imaginary parts of c, exponent m

julzzpwr

   $z(0)$ = pixel;
   $z(n+1)$ = $z(n)^{z(n)}$ + $z(n)^m$ + c.
Three parameters: real & imaginary parts of c, exponent m

kamtorus, kamtorus3d

Series of orbits superimposed.
3d version has 'orbit' the z dimension.
   $x(0) = y(0)$ = orbit/3;
   $x(n+1)$ = $x(n)$*cos(a) + ($x(n)$*$x(n)$-$y(n)$)*sin(a)
   $y(n+1)$ = $x(n)$*sin(a) - ($x(n)$*$x(n)$-$y(n)$)*cos(a)
After each orbit, 'orbit' is incremented by a step size.
Parameters: a, step size, stop value for 'orbit', and
points per orbit.

lambda

Classic Lambda fractal. 'Julia' variant of Mandellambda.
   $z(0)$ = pixel;
   $z(n+1)$ = lambda*$z(n)$*(1 - $z(n)^2$).
Two parameters: real and imaginary parts of lambda.

lambdafn

   $z(0)$ = pixel;

z(n+1) = lambda * fn(z(n)).
Three parameters: real, imag portions of lambda, and fn

lorenz, lorenz3d
Lorenz two lobe attractor - orbit in three dimensions.
In 2d the x and y components are projected to form the image.
  z(0) = y(0) = z(0) = 1;
  x(n+1) = x(n) + (-a*x(n)*dt) + (a*y(n)*dt)
  y(n+1) = y(n) + (b*x(n)*dt) - (y(n)*dt) - (z(n)*x(n)*dt)
  z(n+1) = z(n) + (-c*z(n)*dt) + (x(n)*y(n)*dt)
Parameters are dt, a, b, and c.

lorenz3d1
Lorenz one lobe attractor - orbit in three dimensions.
The original formulas were developed by Rick Miranda and Emily Stone.
  z(0) = y(0) = z(0) = 1; norm = sqrt(x(n)^2 + y(n)^2)
  x(n+1) = x(n) + (-a*dt-dt)*x(n) + (a*dt-b*dt)*y(n)
    + (dt-a*dt)*norm + y(n)*dt*z(n)
  y(n+1) = y(n) + (b*dt-a*dt)*x(n) - (a*dt+dt)*y(n)
    + (b*dt+a*dt)*norm - x(n)*dt*z(n) - norm*z(n)*dt
  z(n+1) = z(n) +(y(n)*dt/2) - c*dt*z(n)
Parameters are dt, a, b, and c.

lorenz3d3
Lorenz three lobe attractor - orbit in three dimensions.
The original formulas were developed by Rick Miranda and Emily Stone.
  z(0) = y(0) = z(0) = 1; norm = sqrt(x(n)^2 + y(n)^2)
  x(n+1) = x(n) +(-(a*dt+dt)*x(n) + (a*dt-b*dt+z(n)*dt)*y(n))/3
    + ((dt-a*dt)*(x(n)^2-y(n)^2)
    + 2*(b*dt+a*dt-z(n)*dt)*x(n)*y(n))/(3*norm)
  y(n+1) = y(n) +((b*dt-a*dt-z(n)*dt)*x(n) - (a*dt+dt)*y(n))/3
    + (2*(a*dt-dt)*x(n)*y(n)
    + (b*dt+a*dt-z(n)*dt)*(x(n)^2-y(n)^2))/(3*norm)
  z(n+1) = z(n) +(3*x(n)*dt*x(n)*y(n)-y(n)*dt*y(n)^2)/2 - c*dt*z(n)
Parameters are dt, a, b, and c.

lorenz3d4
Lorenz four lobe attractor - orbit in three dimensions.
The original formulas were developed by Rick Miranda and Emily Stone.
  z(0) = y(0) = z(0) = 1;
  x(n+1) = x(n) +(-a*dt*x(n)^3
    + (2*a*dt+b*dt-z(n)*dt)*x(n)^2*y(n) + (a*dt-2*dt)*x(n)*y(n)^2
    + (z(n)*dt-b*dt)*y(n)^3) / (2 * (x(n)^2+y(n)^2))
  y(n+1) = y(n) +((b*dt-z(n)*dt)*x(n)^3 + (a*dt-2*dt)*x(n)^2*y(n)
    + (-2*a*dt-b*dt+z(n)*dt)*x(n)*y(n)^2
    - a*dt*y(n)^3) / (2 * (x(n)^2+y(n)^2))
  z(n+1) = z(n) +(2*x(n)*dt*x(n)^2*y(n) - 2*x(n)*dt*y(n)^3 - c*dt*z(n))
Parameters are dt, a, b, and c.

lsystem
Using a turtle-graphics control language and starting with
an initial axiom string, carries out string substitutions the
specified number of times (the order), and plots the resulting.

lyapunov
Derived from the Bifurcation fractal, the Lyapunov plots the Lyapunov

Exponent for a population model where the Growth parameter varies between two values in a periodic manner.

magnet1j

z(0) = pixel;
```
         / z(n)^2 + (c-1) \
z(n+1) = | --------------------- | ^ 2
         \ 2*z(n) + (c-2)   /
```
Parameters: the real and imaginary parts of c

magnet1m

z(0) = 0; c = pixel;
```
         / z(n)^2 + (c-1)   \
z(n+1) = | --------------------- | ^ 2
         \ 2*z(n) + (c-2)    /
```
Parameters: the real & imaginary parts of perturbation of z(0)

magnet2j

z(0) = pixel;
```
         / z(n)^3 + 3*(C-1)*z(n) + (C-1)*(C-2)               \
z(n+1) = |   ----------------------------------------------------------- | ^ 2
         \ 3*(z(n)^2) + 3*(C-2)*z(n) + (C-1)*(C-2) - 1 /
```
Parameters: the real and imaginary parts of c

magnet2m

z(0) = 0; c = pixel;
```
         / z(n)^3 + 3*(C-1)*z(n) + (C-1)*(C-2)               \
z(n+1) = |   ----------------------------------------------------------- | ^ 2
         \ 3*(z(n)^2) + 3*(C-2)*z(n) + (C-1)*(C-2) - 1 /
```
Parameters: the real and imaginary parts of perturbation of z(0)

mandel

Classic Mandelbrot set fractal.
z(0) = c = pixel;
z(n+1) = z(n)^2 + c.
Two parameters: real & imaginary perturbations of z(0)

mandel4

Special case of mandelzpower kept for speed.
z(0) = c = pixel;
z(n+1) = z(n)^4 + c.
Parameters: real & imaginary perturbations of z(0)

mandelfn

z(0) = c = pixel;
z(n+1) = c*fn(z(n)).
Parameters: real & imaginary perturbations of z(0), and fn

Martin

Attractor fractal by Barry Martin - orbit in two dimensions.
z(0) = y(0) = 0;
x(n+1) = y(n) - sin(x(n))
y(n+1) = a - x(n)
Parameter is a (try a value near pi)

mandellambda

z(0) = .5; lambda = pixel;
z(n+1) = lambda*z(n)*(1 - z(n)^2).
Parameters: real & imaginary perturbations of z(0)

manfn+exp
'Mandelbrot-Equivalent' for the julfn+exp fractal.
z(0) = c = pixel;
z(n+1) = fn(z(n)) + e^z(n) + C.
Parameters: real & imaginary perturbations of z(0), and fn

manfn+zsqrd
'Mandelbrot-Equivalent' for the Julfn+zsqrd fractal.
z(0) = c = pixel;
z(n+1) = fn(z(n)) + z(n)^2 + c.
Parameters: real & imaginary perturbations of z(0), and fn

manowar
c = z1(0) = z(0) = pixel;
z(n+1) = z(n)^2 + z1(n) + c;
z1(n+1) = z(n);
Parameters: real & imaginary perturbations of z(0)

manowarj
z1(0) = z(0) = pixel;
z(n+1) = z(n)^2 + z1(n) + c;
z1(n+1) = z(n);
Parameters: real & imaginary perturbations of z(0)

manzpower
'Mandelbrot-Equivalent' for julzpower.
z(0) = c = pixel;
z(n+1) = z(n)^exp + c; try exp = e = 2.71828...
Parameters: real & imaginary perturbations of z(0), real &
imaginary parts of exponent exp.

manzzpwr
'Mandelbrot-Equivalent' for the julzzpwr fractal.
z(0) = c = pixel
z(n+1) = z(n)^z(n) + z(n)^exp + C.
Parameters: real & imaginary perturbations of z(0), and exponent

marksjulia
A variant of the julia-lambda fractal.
z(0) = pixel;
z(n+1) = (c^exp)*z(n) + c.
Parameters: real & imaginary parts of c, and exponent

marksmandel
A variant of the mandel-lambda fractal.
z(0) = c = pixel;
z(n+1) = (c^exp)*z(n) + c.
Parameters: real & imaginary perturbations of z(0), and exponent

marksmandelpwr
The marksmandelpwr formula type generalized (it previously
had fn=sqr hard coded).

z(0) = pixel, c = z(0) ^ (z(0) - 1):
z(n+1) = c * fn(z(n)) + pixel,
Parameters: real and imaginary pertubations of z(0), and fn

newtbasin

Based on the Newton formula for finding the roots of z^p - 1.
Pixels are colored according to which root captures the orbit.
z(0) = pixel;
z(n+1) = ((p-1)*z(n)^p + 1)/(p*z(n)^(p - 1)).
Two parameters: the polynomial degree p, and a flag to turn
on color stripes to show alternate iterations.

newton

Based on the Newton formula for finding the roots of z^p - 1.
Pixels are colored according to the iteration when the orbit
is captured by a root.
z(0) = pixel;
z(n+1) = ((p-1)*z(n)^p + 1)/(p*z(n)^(p - 1)).
One parameter: the polynomial degree p.

pickover

Orbit in three dimensions defined by:
x(n+1) = sin(a*y(n)) - z(n)*cos(b*x(n))
y(n+1) = z(n)*sin(c*x(n)) - cos(d*y(n))
z(n+1) = sin(x(n))
Parameters: a, b, c, and d.

plasma

Random, cloud-like formations.   Requires 4 or more colors.
A recursive algorithm repeatedly subdivides the screen and
colors pixels according to an average of surrounding pixels
and a random color, less random as the grid size decreases.
Three parameters: 'graininess' (.5 to 50, default = 2), old/new
algorithm, seed value used.

popcorn

The orbits in two dimensions defined by:
x(0) = xpixel, y(0) = ypixel;
x(n+1) = x(n) - h*sin(y(n) + tan(3*y(n))
y(n+1) = y(n) - h*sin(x(n) + tan(3*x(n))
are plotted for each screen pixel and superimposed.
One parameter: step size h.

popcornjul

Conventional Julia using the popcorn formula:
x(0) = xpixel, y(0) = ypixel;
x(n+1) = x(n) - h*sin(y(n) + tan(3*y(n))
y(n+1) = y(n) - h*sin(x(n) + tan(3*x(n))
One parameter: step size h.

rossler3D

Orbit in three dimensions defined by:
x(0) = y(0) = z(0) = 1;
x(n+1) = x(n) - y(n)*dt -   z(n)*dt
y(n+1) = y(n) + x(n)*dt + a*y(n)*dt
z(n+1) = z(n) + b*dt + x(n)*z(n)*dt - c*z(n)*dt

Parameters are dt, a, b, and c.

sierpinski

Sierpinski gasket - Julia set producing a 'Swiss cheese triangle'

$z(n+1) = (2*x, 2*y-1)$ if $y > .5$;
else $(2*x-1, 2*y)$ if $x > .5$;
else $(2*x, 2*y)$

No parameters.

spider

$c(0) = z(0) = pixel$;
$z(n+1) = z(n)^2 + c(n)$;
$c(n+1) = c(n)/2 + z(n+1)$

Parameters: real & imaginary perturbation of $z(0)$

sqr(1/fn)

$z(0) = pixel$;
$z(n+1) = (1/fn(z(n))^2$

One parameter: the function fn.

sqr(fn)

$z(0) = pixel$;
$z(n+1) = fn(z(n))^2$

One parameter: the function fn.

test

'test' point letting us (and you!) easily add fractal types via
the c module testpt.c.   Default set up is a mandelbrot fractal.
Four parameters: user hooks (not used by default testpt.c).

tetrate

$z(0) = c = pixel$;
$z(n+1) = c^{z(n)}$

Parameters: real & imaginary perturbation of $z(0)$

tim's_error

A serendipitous coding error in marksmandelpwr brings to life
an ancient pterodactyl!   (Try setting fn to sqr.)

$z(0) = pixel, c = z(0) ^ (z(0) - 1)$:
$tmp = fn(z(n))$
$real(tmp) = real(tmp) * real(c) - imag(tmp) * imag(c)$;
$imag(tmp) = real(tmp) * imag(c) - imag(tmp) * real(c)$;
$z(n+1) = tmp + pixel$;

Parameters: real & imaginary pertubations of $z(0)$ and function fn

unity

$z(0) = pixel$;
$x = real(z(n)), y = imag(z(n))$
$One = x^2 + y^2$;
$y = (2 - One) * x$;
$x = (2 - One) * y$;
$z(n+1) = x + i*y$

No parameters.

#[40]$[41]+[42]K[43]
Zooming in on an Image

There are two different methods of generating and using "Zoom-Boxes".   Which method you use depends on which of the "Zoom Box" checkboxes you have selected using the "Views" menuitem. If you've never selected any of these checkboxes, the "Zoom In" option is in effect.

If you have the "Zoom In Box" or "Zoom Out Box" options enabled, Winfract's zoom box is activated in the following fashion:

With the "Zoom In Box" option activated, move your mouse pointer to the center of the area you wish to zoom in on.   Press and hold down the left mouse button as you move the mouse away from that center point.   A "Zoom Box" will be displayed, changing in size as you move the mouse. When you have the zoom box the size you want, let go of the left mouse button.
If you want to adjust the location of the zoom box at this point, move your mouse pointer inside the zoom box, press and hold down the left mouse button again, and move the mouse.   The zoom box follows the mouse pointer until you let go of the left mouse button.
To activate the zoom, double-click the left mouse button with the mouse pointer inside the zoom box.   To disable the zoom box instead (say, you changed your mind, or the box isn't really the right size), double-click on the left mouse button with the mouse pointer positioned somewhere outside of the zoom box (pressing the ESCAPE key gets rid of the zoom box, too).

"Zoom Out" works just like "Zoom In", except that you will be zooming out - the zoom box is actually showing you where on the new image your current image will display.

If you have enabled the "Zoom-Box" option, a vertical Zoom-Box scroll-bar is displayed in addition to your fractal image.   The Zoom-Box defaults to the mid-position, in which your Zoom-Box exactly covers the area of your fractal image.   Moving the scroll-button up shrinks your zoom-box (and makes it visible on the fractal image).   You can them move the zoom-box around by moving your cursor inside the zoom-box and then holding down your left mouse-button and moving the cursor and zoom-box as a single unit.   Double-clicking the left mouse button will cause your image to be redrawn using your current zoom-box coordinates.

You can also "Zoom Out" by moving the zoom-box scroll bar below the midpoint.   When you do this, the zoom-box that is displayed is actually showing you where (and how small) your currently displayed image would be if you double-clicked the left mouse button at that point.   Moving the zoom-box and double-clicking to perform the zoom is done the same way as when you are "zooming in".

40# zoom_index
41$ Zooming in on an image
42+ browse:040
43K zooming;zoom in; zoom out; zoom bar

Mandelbrot/Julia Toggling

You can switch from a "Mandelbrot Set" image to its "Julia Set" at the location of the mouse cursor by clicking on the right mouse button.   When the corresponding "Julia Set" image is on the screen, click the right mouse button again to get the "Mandelbrot Set" image back.   The terms "Mandelbrot Set" and "Julia Set" are in quotes because many fractal types (mandel4 and julia4, for instance) have this "Mandelbrot Set"/"Julia Set" relationship.

₄₄# julia_index
₄₅$ Mandelbrot/Julia Toggling
₄₆+ browse:043
₄₇K Mandelbrot/Julia toggling

#[48]$[49]+[50]K[51]
Color Cycling

You start and stop Color-cycling mode using the Color-Cycling menu.   This menu also lets you determine the direction of the cycling (the designations "in" and "out" were arbitrarily picked based on how the effect looked on a single Mandelbrot image), whether to just rotate the existing colors or generate new ones randomly, and (for random color-generation) whether the colors are to change with a low, medium, or high frequency.

You can also use   the following "**Hot-keys**" for color-cycling
    spacebar - toggles color-cycling on and off
    '<', '>' - shifts the palette "in" or "out" one color
    left, right arrows - turn on color-cycling and set the "direction"
    up, down arrows - speed up or slow down the color-cycling speed
    ENTER - initiate random color-cycling with all new colors
    (Note that Windows takes a second or so to "fire up" color-cycling,   so be patient when you press one of these keys.)

Sorry, but at the current time color-cycling is restricted to display devices whose Windows drivers are capable of palette manipulation - and the "stock" VGA driver distributed with Win 3.x doesn't have it!   In fact, at the moment the only Windows video drivers we've ever seen capable of palette manipulation have been 256-color drivers.   If Winfract ever does find itself running with a palette-based 16-color video driver (it's theoretically possible), it will color-cycle only when its window has the input focus (temporarily converting the remainder of your Windows screen to black-and-white), and return to the "stock" palette values when it loses this focus.

48# cycling_index
49$ Color Cycling
50+ browse:045
51K cycling

#[52]$[53]+[54]K[55]

Distribution Policy, Contacting the Authors, The Book

The Stone Soup Group is a loosely associated group of fanatic programmers.   Winfract (Fractint for Windows) like Fractint for DOS, is copyrighted freeware. Our motto is simple: **Don't want money. Got money. Want admiration**.   This means we encourage prolific use and distribution of Winfract not for money, but for the pleasure of knowing you enjoy it.   So play with it, change it, learn from the source code, put the fractals in your artwork, whatever.   But don't sell it or bundle it with your commercial product without permission.   That is illegal.

Conditions on use:

Winfract (Fractint for Windows) like Fractint for DOS, is copyrighted freeware.   As such, it may be freely copied and distributed but may not be sold.   Winfract may be distributed by shareware and freeware distributors and a nominal distribution fee may be charged for media and handling.   Winfract may also be distributed on networks and BBSs.   Winfract may be used personally or in a business - if you can do your job better by using Winfract, or using images from it, that's great!   Winfract may not be given away with commercial products without explicit permission from the Stone Soup Group.

There is no warranty of Winfract's suitability for any purpose, nor any acceptance of liability, express or implied.

Contacting the Authors

Virtually all of the Fractint and Winfract authors can be found on the **CompuServe** network in the **GRAPHDEV** ("Graphics Development") forum in Section 4 ("Fractal Sources").   Fractint and Winfract development occurs in the GRAPHDEV forum - most of the authors have never met except there.   New members are always welcome!

You can also send letters to us in care of Waite Group Press, 200 Tamal Plaza, Corte Madera, Ca 94925.

The Book

Version   17.5 of Winfract was licensed to Waite Group Press for use in our book, **Fractals for Windows**.   The book is available at all fine boostores, book chains, and Superstores.   Ask for Fractals for Windows by Wegner, et al, ISBN 1-878739-25-5, $34.95, published by Waite Group Press.   You can order directly from Waite Group Press by calling 1-800-368-9369 in the USA and 415-924-2575 in California or outside the USA.   Although the book describes a slightly older version of Winfract than this one, it's still an excellent source of information on fractals in general and Winfract in particular.

Program Updates

New versions of Winfract and Fractint are uploaded to the CompuServe network, and make their way to other systems from that point.   The latest version of Winfract can be found in the "Fractal Sources" library of GRAPHDEV as **WINFRA.ZIP** (Executable/Docs) and **WINSRC.ZIP** (Complete

52# distrib_index
53$ Distribution Policy
54+ browse:065
55K distribution policy;freeware;copyright;contacting authors

Source).   If you're not a CompuServe subscriber, but wish to get more information about CompuServe and its graphics forums, feel free to call their 800 number (800-848-8199) and ask for operator number 229.

If you don't have access to CompuServe, many other sites tend to carry these files shortly after their initial release (although sometimes using different naming conventions).   In particular...

If you speak Internet and FTP, SIMTEL20 and its various mirror sites tend to carry new versions of Winfract and Fractint shortly after they are released.   Look in the PD:<MSDOS.GRAPHICS> and PD:<MSDOS.WINDOWS3> directories for these files .

Your favorite local BBS may carry these files as well (although perhaps not the latest versions) using naming conventions like WINFRA*.ZIP and FRAINT*.ZIP.   One BBS that *does* carry the latest version is the "Ideal Studies BBS" (508)757-1806, 1200/2400/9600HST.   Peter Longo is the SYSOP and a true fractal fanatic.   There is a very short registration, and thereafter the entire board is open to callers on the first call.

Many Shareware/Freeware library services will ship you diskettes containing the latest versions of Fractint for a nominal fee that basically covers their cost of packaging and a small profit that we don't mind them making. One in particular is the Public (Software) Library, PO Box 35705, Houston, TX 77235-5705, USA.   Their phone number is 800-242-4775 (outside the US, dial 713-524-6398).   Ask for item #9112 for five 5.25" disks, #9113 for three 3.5" disks.   Cost is $6.99 plus $4 S&H in the U.S./Canada, $11 S&H overseas.
                      ...

#[56]$[57]+[58]K[59]
A list of Winfract and Fractint Authors

Winfract (Fractint for Windows) was originally ported from Fractint-for-DOS by Bert Tyler.   This is the first Windows program that Bert ever wrote,which goes a long way towards explaining a lot of the bugs.   Bert's task was made a lot easier by Pieter Branderhorst, who separated the MSDOS-specific code from Fractint-for-DOS's fractal generator modules, making a Windows port of the package possible.   Mark Peterson helped track down and eliminate a lot of the bugs that were in the original program, and has since added several new options which take advantage of the capabilities of the Windows environment.

Fractint for Windows is based heavily on (and uses the fractal generator engines straight out of) Fractint-for-DOS.   A partial list of the authors of Fractint-for-DOS, taken from Fractint version 17.1, includes:

```
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Ethan Nagel	[70022,2552] Palette editor, integrated help/doc system
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56# authors_index
57$ Who wrote this program?
58+ browse:070
59K authors

Marc Reinig	[72410,77] Lots of 3D options
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Nicholas Wilt	Lsystem speedups
Richard Wilton	Tweaked VGA Video modes

...

Byte Magazine	Tweaked VGA Modes
MS-Kermit	Keyboard Routines
PC Magazine	Sound Routines
PC Tech Journal	CPU, FPU Detectors