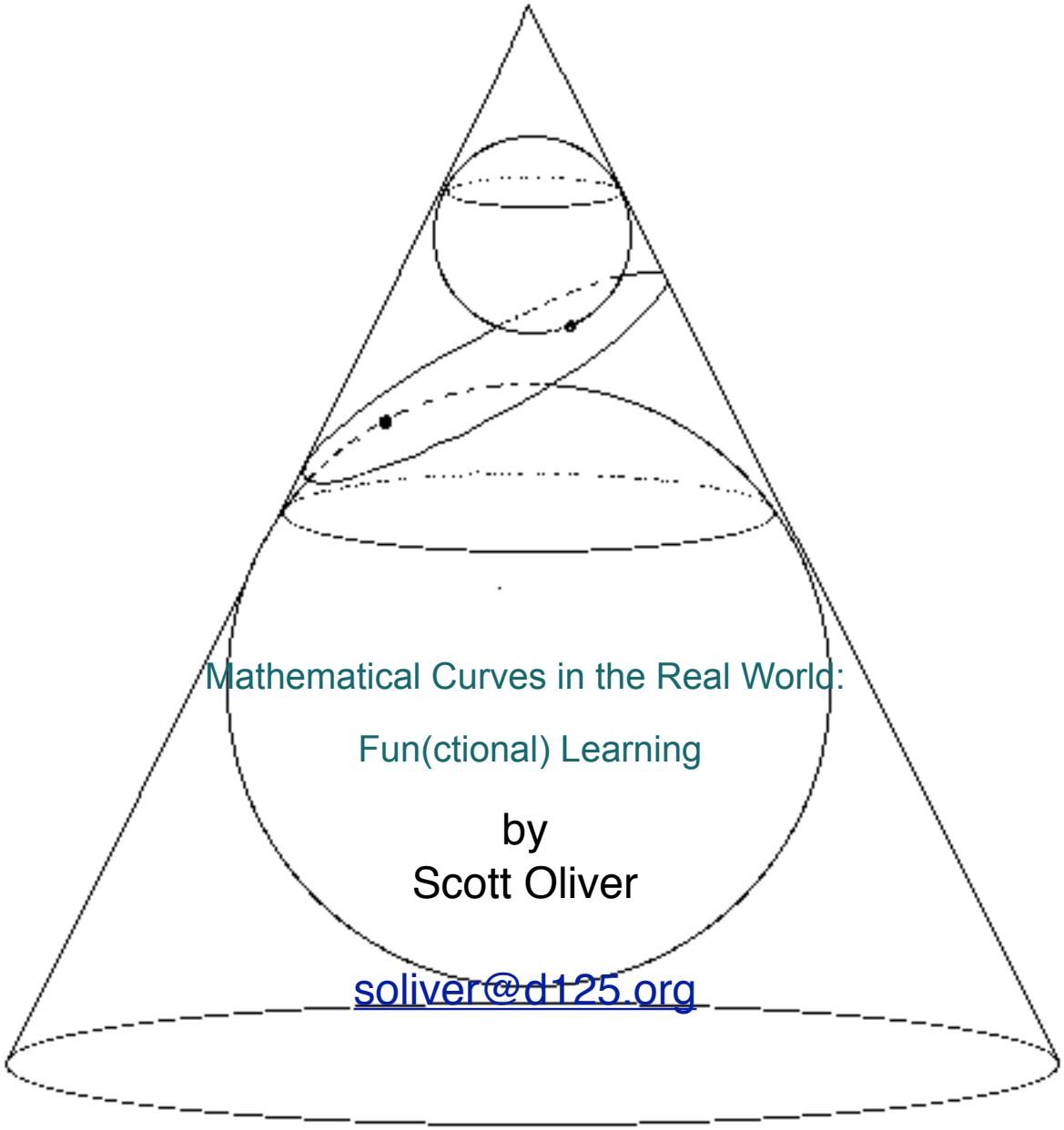

Mathematical Curves in the Real World:

Fun(ctional) Learning

by
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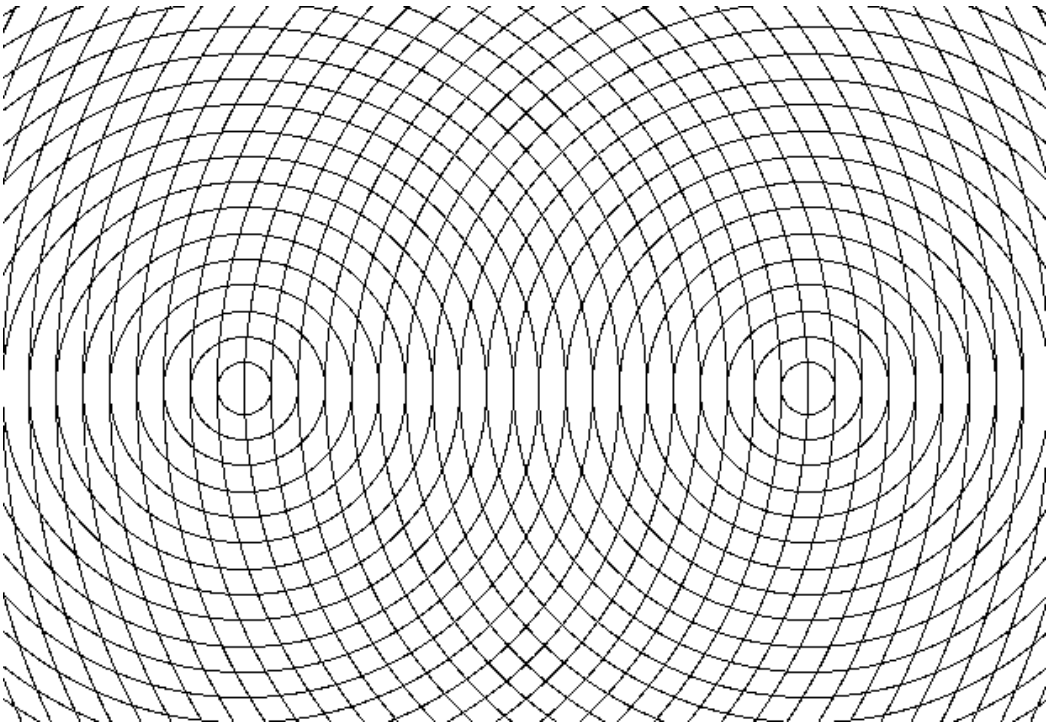
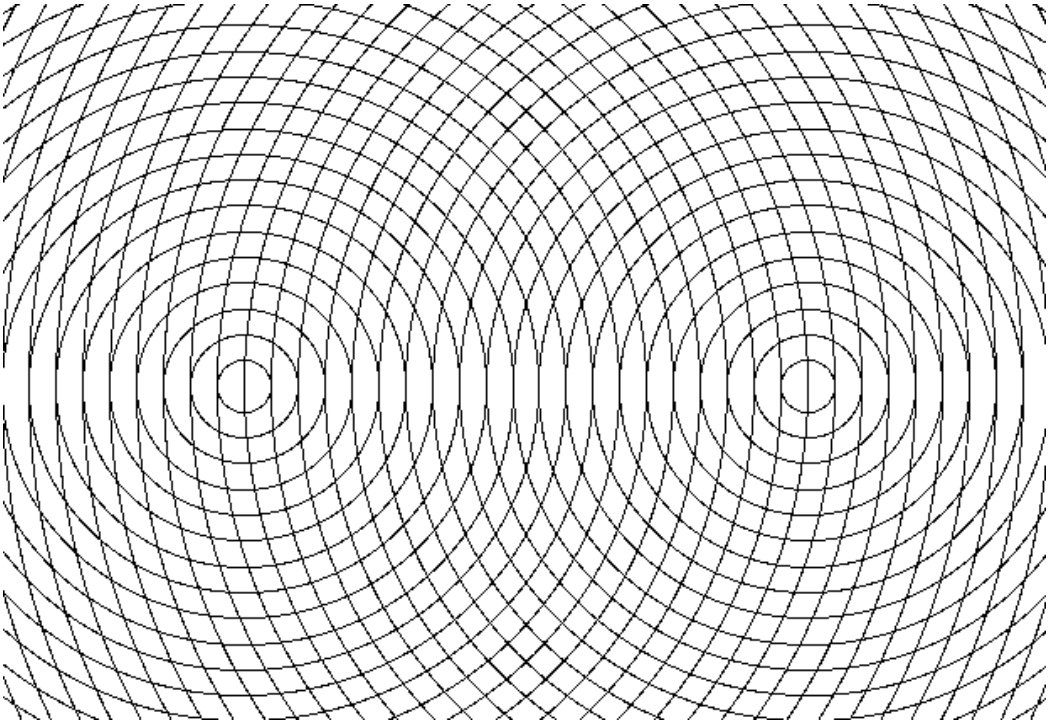




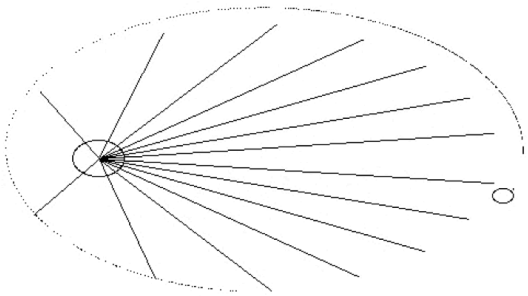
```
REM True BASIC program to illustrate planetary movement
REM Modified from JAVA program written by Kelly Brown
SET WINDOW -100,100,-100,100      ! puts graphics origin in center of screen
BOX CIRCLE -3,3,-5,5              ! Draw Sun
OPTION ANGLE degrees              ! uses degrees - not radians
LET e=.6                          ! eccentricity of ellipse
LET dt=.1                         ! delta time
LET ctr =0
DO
  LET radius= (1-e^2)/(1-e*cos(ang))  ! polar form of ellipse
  LET deltaang= 2*pi*sqr(1-e^2)/radius^2*dt     ! delta ang to match gravitational effects
  LET tim=tim+dt
  LET ctr=ctr+1
  ! IF ang <360 and mod(ctr,40)=0 then PLOT LINES: 0,0;px,py     ! plots equal areas
  LET ang=ang+deltaang
  BOX CLEAR px-2,px+2,py-2,py+2  ! erase old planet
  LET px= 60*radius*cos(ang)
  LET py= 60*radius*sin(ang)
  BOX CIRCLE px-1,px+1,py-1,py+1      ! draw new planet
  PAUSE .001
LOOP until key input              ! loops until a key is pushed
END



! Wallpaper for the Mind variations
! Original idea from John Connett as described by A. K. Dewdney
! in "The Armchair Universe", W.H. Freeman and Company, 1988
! True BASIC program by Scott Oliver

INPUT prompt "what size (horizontal) for screen?":xsize    ! inputs screen dimension
LET ysize = xsize*(460/640)       ! screen resolution is 640x460
SET WINDOW -xsize,xsize,-ysize,ysize   ! puts graphics origin in center of screen
CLEAR
FOR x = -xsize to 0 step 2*xsize/640   ! 640 is horizontal resolution of screen
   FOR y= -ysize to ysize step 2*ysize/460      ! 460 is vertical resolution of screen
      LET fnval= x^2/4 +y^2/1   ! change this line for different functions
      SET COLOR 30*mod(int(fnval),6)      ! # colors set to 256
      PLOT x,y
      PLOT -x,y
   NEXT y
NEXT x
END
```

```
! Draws Hyperboloid by rotating strings
! Written in True BASIC by Scott Oliver
SET WINDOW -20,20,-15,15
OPTION BASE 0
OPTION ANGLE degrees
DIM px(2,60),py(2,60)
LET np =50
SUB init (p)
   LET rad =10
   LET angx=15
   LET ang = 360/np
   FOR i = 0 to np
      LET x = cos(i*ang)*rad
      LET y = sin(i*ang)*rad
      LET px(1,i)= -cos(angx)*x+y
      LET py(1,i)=-sin(angx)*x-10
      LET px(2,i)=-cos(angx)*x+y
      LET py(2,i)=-sin(angx)*x+10
   NEXT i
END SUB
SUB drawc(inc)
   PLOT LINES: -20,0;20,0
   PLOT LINES: 0,-20;0,20
   PLOT LINES: -20*cos(angx),-20*sin(angx);20*cos(angx),20*sin(angx)
   REM draw top and bottom
   set color "black"
   FOR i = 0 to np-1
      PLOT LINES: px(1,i),py(1,i);px(1,i+1),py(1,i+1)
      PLOT LINES: px(2,i),py(2,i);px(2,i+1),py(2,i+1)
   NEXT i
   FOR i = 0 to np-1
      set color 20* mod (i,14)+10
      PLOT LINES: px(1,i),py(1,i);px(2,mod(i+inc,np)),py(2,mod(i+inc,np))
   NEXT i
END SUB
CALL init(p)
FOR inc = 0 to np
   CLEAR
   CALL drawc(inc)
   PAUSE 1
NEXT inc
END
```



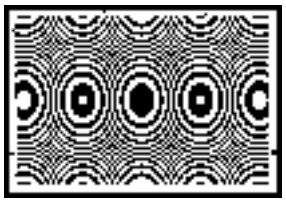
```
!Draws concentric circles
!Written in True BASIC
SET WINDOW -20,20,-15,15
FOR r = 1 to 40
      BOX CIRCLE -10-r,-10+r,-r,r
      BOX CIRCLE 11-r,11+r,-r,r
NEXT r
END
```

ParabFold

```
AxesOff
FnOff
PlotsOff
-10 -> Xmin
10 -> Xmax
FnOff
ClrDraw
Prompt F
-F-1 -> Ymin
F+7 -> Ymax
Circle(0,F,.2)
Line(-20,-F,20,-F)
Pause
For(X,-6,6,1.0)
-F -> Y
If X=0
Then
500 -> M
Else
-F/X -> M
End
-1/M -> N
X/2 -> P
0 -> Q
-150 -> R
N(R-P)+Q -> S
150 -> T
N(T-P)+Q -> U
Line(R,S,T,U)
End
```

CircleFold

```
AxesOff
FnOff
PlotsOff
ZStandard
ZSquare
ClrDraw
Circle(0,0,8)
Degree
Prompt F
Circle(F,0,.2)
Circle(0,0,.2)
For(D,0,360,10)
cos(D)*8 -> X
sin(D)*8 -> Y
If X=F
Then
500 -> M
Else
Y/(X-F) -> M
End
If M=0
Then
500 -> N
Else
-1/M -> N
End
(X+F)/2 -> P
(Y+0)/2 -> Q
-150 -> R
N(R-P)+Q -> S
150 -> T
N(T-P)+Q -> U
Line(R,S,T,U)
End
```



Planets

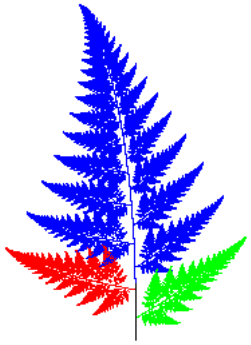
```
Degree
.4 -> E
.5 -> D
-1 -> Xmin
1.5 -> Xmax
-1.5 -> Ymin
1.5 -> Ymax
AxesOff
ClrDraw
0 -> A
0 -> T
0 -> C
Pt-On(0,0)
While (A<720)
(1-E^2)/(1-Ecos((A) -> R
2π√((1-E^2)/R^2*D -> G
C+1 -> C
A+G -> A
R*cos((A) -> X
R*sin((A) -> Y
Pt-On(X,Y)
If (fPart((C/10)=0)*(A<360)
Line(0,0,X,Y)
End
```

Wallpaper

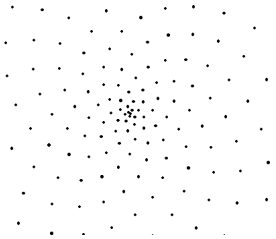
```
ClrDraw
AxesOff
FnOff
For(X,Xmin,Xmax,ΔX)
For(Y,Ymin,Ymax,ΔY)
int(X^2+Y^2/4) -> Z
If int(Z/2)=Z/2
Pt-On(X,Y)
End
End
```

IFS (FERN)

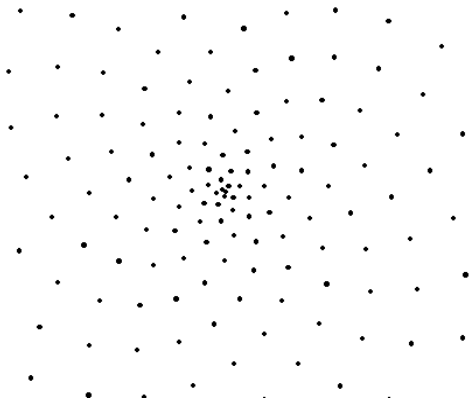
```
ClrDraw
FnOff
PlotsOff
AxesOff
Input “CUSTOM? (USE 0)”,D
If D=0
Goto 1
{.01,.075,.84,.075}->L1
-.1->XMin
1.1->XMax
-.1->YMin
1.2->YMax
[[0,0][0,.172]]->[A]
[[.076,.312][-.257,.204]]->[B]
[[.821,-.028][.03,.845]]->[C]
[[-.024,-.356][-.323,.074]]->[D]
[[.496][-.091]]->[E]
[[.494][.133]]->[F]
[[.088][.176]]->[G]
[[.47][.26]]->[H]
[[.5][.5]]->[I]
Lbl 1
For(A, 1, 5000)
rand->R
If R≤ L1(1)
Then
[A]*[I]+[E] ->[I]
Else
If R≤ L1(1)+L1(2)
Then
[B]*[I]+[F] ->[I]
Else
If R≤ L1(1)+L1(2)+L1(3)
Then
[C]*[I]+[G] ->[I]
Else
[D]*[I]+[H] ->[I]
End
End
End
Pt-On([I](1,1),[I](2,1))
End
```



SUNFLOWR



```
ClrDraw
FnOff
PlotsOff
AxesOff
Degree
ZStandard
ZSquare
ClrHome
Input “ANG INC?”,I
Input “RAD INC?”,J
0->A
.1->R
For(B,1,450)
Pt-On(Rcos(A),Rsin(A))
A+I->A
R+J->R
End
```



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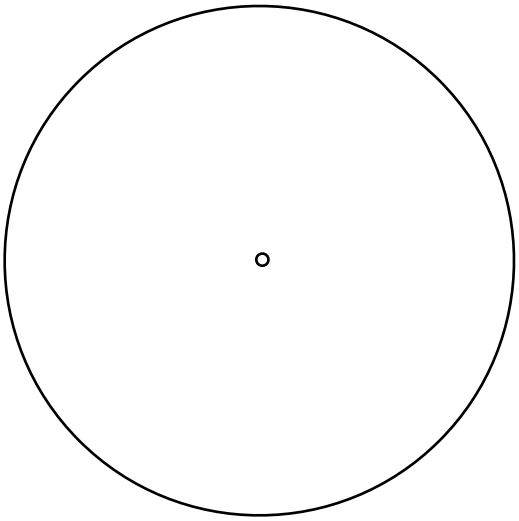

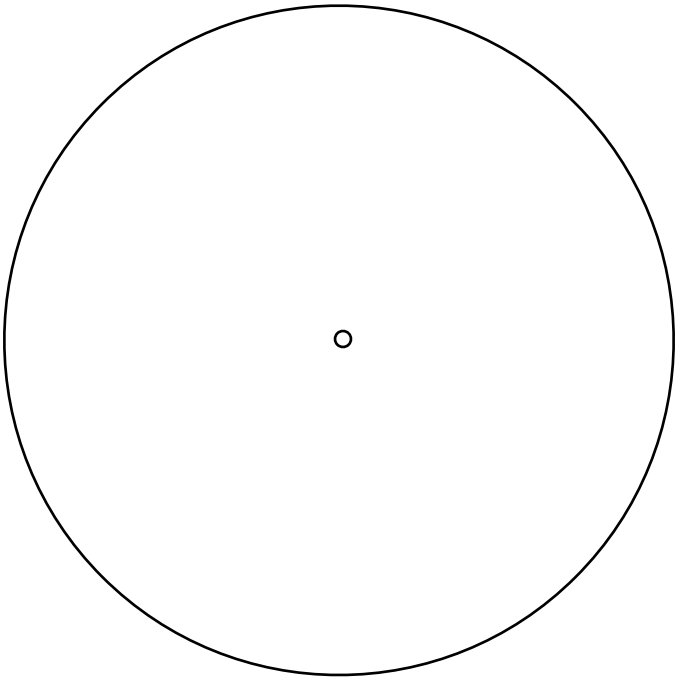

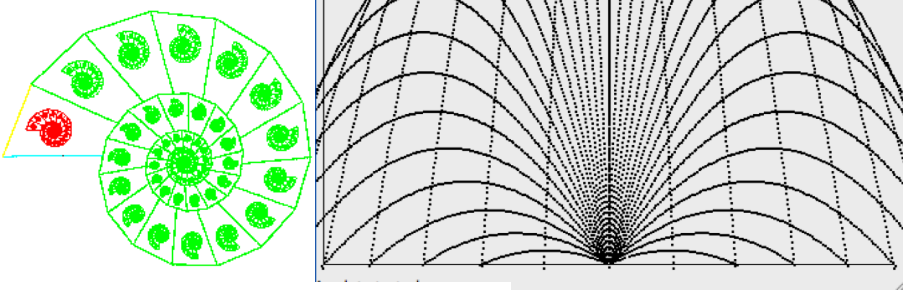

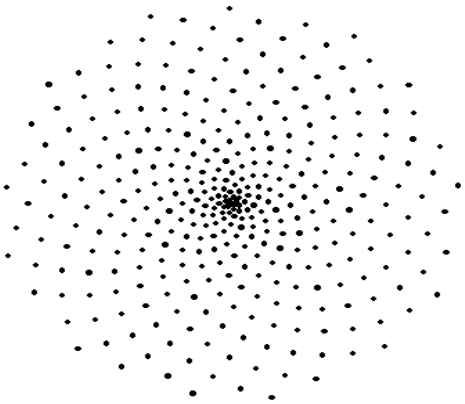

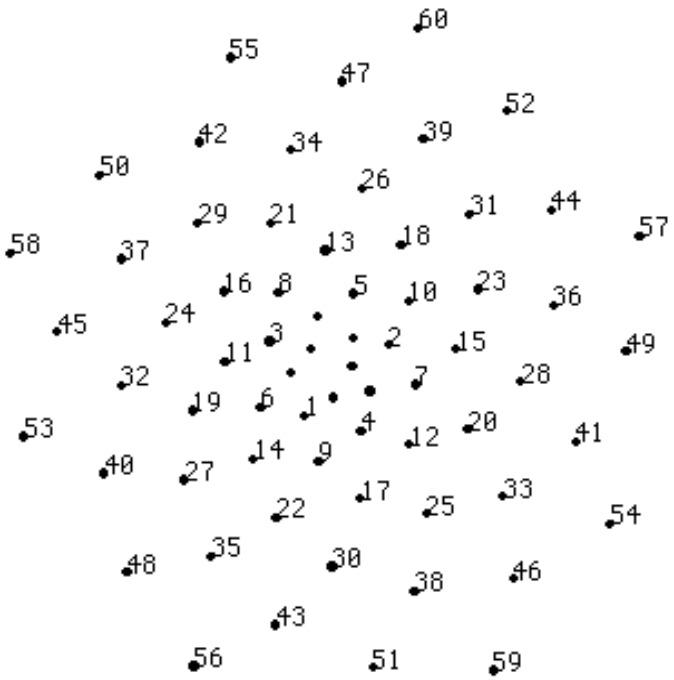
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