

## グラフ

```
1 program Kyokusen2; // 学生証番号 氏名
2 {$APPTYPE CONSOLE}
3 uses SysUtils;
4
5 type
6   TZahyou = -19..19;
7   THeimen = array [TZahyou,TZahyou] of Integer;
8
9 var
10  Heimen : THeimen;
11
12 procedure WriteHeimen;
13   { 平面の内容を画面に書き出す }
14 var
15   X,Y : TZahyou;
16 begin
17   for X := -19 to 19 do
18     begin
19       for Y := -19 to 19 do
20         begin
21           case Heimen[X,Y] of
22             0 : Write(' ');
23             1 : Write(' '); // は「けいせん」を変換して選ぶ
24             2 : Write(' '); // "
25             3 : Write(' '); // "
26             4 : Write(' * ');
27             5 : Write(' # ');
28           end;
29         end;
30         WriteLn;
31       end;
32     end; {WriteHeimen}
33
34 procedure HeimenSyokika;
35   { 白紙の状態にして、座標軸の情報を入れる }
36 var
37   X,Y : TZahyou;
38 begin
39   for X := -19 to 19 do
40     begin
41       for Y := -19 to 19 do
42         begin
43           Heimen[X,Y] := 0; // 白紙
44         end;
45       end;
46     end;
47   for X := -19 to 19 do
48     begin
49       Heimen[X,0] := 1; // x軸
50     end;
51   for Y := -19 to 19 do
52     begin
53       Heimen[0,Y] := 2; // y軸
54     end;
55   Heimen[0,0] := 3; // 原点
56 end; {HeimenSyokika}
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57 procedure SinNoGraph;
58     {  $y = 10\sin(10 x^\circ)$  のグラフの情報を入れる }
59     var
60         X,Y : TZahyou;
61         Theta : Real;
62     begin
63         {
64         for X := -18 to 18 do
65             begin
66                 Y := Round(10*Sin(X/18*Pi));
67                 Heimen[X,Y] := 4;
68             end;
69         }
70         Theta := -Pi;
71         repeat
72             X := Round(Theta/Pi*18);
73             Y := Round(10*Sin(Theta));
74             Heimen[X,Y] := 4;
75             Theta := Theta+Pi/30;
76         until Theta > Pi;
77     end; {SinNoGraph}
78
79 procedure CosNoGraph;
80     {  $y = 10\cos(10 x^\circ)$  のグラフの情報を入れる }
81     var
82         X,Y : TZahyou;
83         Theta : Real;
84     begin
85         {
86         for X := -18 to 18 do
87             begin
88                 Y := Round(10*Cos(X/18*Pi));
89                 Heimen[X,Y] := 4;
90             end;
91         }
92         Theta := -Pi;
93         repeat
94             X := Round(Theta/Pi*18);
95             Y := Round(10*Cos(Theta));
96             Heimen[X,Y] := 5;
97             Theta := Theta+Pi/30;
98         until Theta > Pi;
99     end; {CosNoGraph}
100
101 procedure Cardioid;
102     { 心臓形 の情報を入れる }
103     {  $x = a(2\cos\theta - \cos 2\theta)$  }
104     {  $y = a(2\sin\theta - \sin 2\theta)$  }
105     var
106         X,Y : TZahyou;
107         Theta : Real;
108     begin
109         Theta := 0;
110         repeat
111             X := Round(6*(2*Cos(Theta)+Cos(2*Theta)));
112             Y := Round(6*(2*Sin(Theta)+Sin(2*Theta)));
113             Heimen[X,Y] := 4;
114             Theta := Theta+Pi/180;           // 1° 増やす

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115     until Theta > Pi*2;           // 360° を超えるまで繰り返す
116     end; {Cardioid}
117
118     procedure Nephroid;
119         { 腎臓形 の情報を入れる      }
120         {   x = a (3 cos  - cos 3 ) }
121         {   y = a (3 sin  - sin 3 ) }
122     var
123         X,Y : TZahyou;
124         Theta : Real;
125     begin
126         Theta := 0;
127         repeat
128             X := Round(4*(3*Cos(Theta)+Cos(3*Theta)));
129             Y := Round(4*(3*Sin(Theta)+Sin(3*Theta)));
130             Heimen[X,Y] := 4;
131             Theta := Theta+Pi/180;           // 1° 増やす
132         until Theta > Pi*2;           // 360° を超えるまで繰り返す
133     end; {Nephroid}
134
135     procedure Asteroid;
136         { 星芒形 の情報を入れる      }
137         {   x = a cos^3   }
138         {   y = a sin^3   }
139     var
140         X,Y : TZahyou;
141         Theta : Real;
142     begin
143         Theta := 0;
144         repeat
145             X := Round(18*(Sqr(Cos(Theta))*Cos(Theta)));
146             Y := Round(18*(Sqr(Sin(Theta))*Sin(Theta)));
147             Heimen[X,Y] := 4;
148             Theta := Theta+Pi/180;           // 1° 増やす
149         until Theta > Pi*2;           // 360° を超えるまで繰り返す
150     end; {Asteroid}
151
152     begin {Main}
153         HeimenSyokika;
154         SinNoGraph;
155         CosNoGraph;
156         WriteHeimen;
157         ReadLn;
158         HeimenSyokika;
159         Cardioid;
160         WriteHeimen;
161         ReadLn;
162         HeimenSyokika;
163         Nephroid;
164         WriteHeimen;
165         ReadLn;
166         HeimenSyokika;
167         Asteroid;
168         WriteHeimen;
169         ReadLn;
170     end.

```