Wydruk programu ,,Socz_zakrzyw" do wytworzenia rysunków do soczewki zakrzywionej pod kątem 45 stopni

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Exit[]
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KadaptRK3BS[XY_] :=
 Module[{k1, k2, k3, k4, x = First@XY, Y = Drop[XY, 1], ΔY23, Δk, hstare},
  hstare = h;
  k1 = h FIO;
  k2 = h F[x + 1/2 h, ##] & @@ (Y + 1/2 k1);
  k3 = h F[x + 3/4 h, ##] & @@ (Y + 3/4 k2);
  Y3 = Y + (2/9 k1 + 1/3 k2 + 4/9 k3);
  FIO = F[x + h, ##] & @@ Y3;
  k4 = h FIO;
  ΔY23 = Abs[ 1/72 (5 k1 - 6 k2 - 8 k3 + 9 k4)];
  Δk = Max@ ΔY23/(Abs[Y3] + Abs[Y3 - Y]);
  h = hstare If[δ > Δk, Min[(δ/Δk)^(1/3), 5], Max[(δ/Δk)^(1/3), 1/5]];
  ndone++;
  Flatten@{x + hstare, Y3}]
```

```mathematica
makeGraph[iniDat_ : {-6, -1.5, π/180 80, 0}, P_ : 0.8, λ_ : 400] :=
 Module[{graf, hstart, v, dvx, dvy, λ1 = 400, λ2 = 720,
    ϵ = 0.2, kolor = ColorData["VisibleSpectrum"][λ]},
   {w = 8, v = 0.5, a = 1, b = 3, ro = 1, u = Sqrt[((x - y)/a)^2 + ((x + y)/b)^2]};
   n1 = 1 + P ((1 + Exp[-ro / v])/(1 + Exp[u - ro / v]));
   nn[x_, y_] = n1 + ((-1 + n1) ϵ (λ^2 - λ1^2) λ2^2)/(λ^2 (λ1^2 - λ2^2));
   gWsp = Plot[nn[x, 0], {x, -w, w}, PlotRange → {All, {0, 3}}];
   tlo = ContourPlot[nn[x, y],
     {x, -w, w}, {y, -w, w}, Contours → 29, PlotPoints → 39];

   v[x_, y_] = Log@(nn[x, y]);
   dvx[x_, y_] = D[v[x, y], x];
   dvy[x_, y_] = D[v[x, y], y];
   F[s_, x_, y_, ϕ_, t_] = {Cos[ϕ], Sin[ϕ],
       dvy[x, y] Cos[ϕ] - dvx[x, y] Sin[ϕ], Exp@(v[x, y])} // Simplify;

   {s0, s1} = {0, ∞};
   {x0, y0, ϕ0, t0} = iniDat;

   hstart[] := Module[{f, df, fdf, Y0, x, y, ϕ, t, s, tmp},
     Y0 = Abs[{x0, y0, ϕ0}];
     f = Take[F[s0, x0, y0, ϕ0, t0], 3];
     df = Transpose[(D[Take[F[s, x, y, ϕ, t], 3], #] & /@ {x, y, ϕ}) /. s → s0 /.
           x → x0 /. y → y0 /. ϕ → ϕ0];
     fdf = Abs[f.df];
     tmp = Flatten@

       Table[If[fdf[[i]] > 0, Min[Sqrt[(2 Y0[[i]])/fdf[[i]]], Abs[f[[i]]]/fdf[[i]]], ∞], {i, 1, 3}];

       Sqrt[δ] Min@tmp];
Clear[sol, tor];
   {δ = 10^-8, h = hstart[], hmax = ∞, nmax = 10 000, ndone = 0,};
   FIO = F[s0, x0, y0, ϕ0, 0];
   sol = NestWhileList[KadaptRK3BS, {s0, x0, y0, ϕ0, t0},
     (w ≥ Abs[#[[2]]] && w ≥ Abs[#[[3]]] && #[[1]] < s1 && ndone < nmax) &];
   Print["ndone= ", ndone];
   tor[tkolor_] :=
    ListPlot[{#[[2]], #[[3]]} & /@ sol, Joined → True, PlotStyle → tkolor];
   graf = Show[tor[kolor], PlotRange → All, AspectRatio → 1];
   Print[Show[{tlo, graf}]];
   graf]
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Rysunek 7.18

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gr180 = makeGraph[{5, -5, π/180 179.9, 0}, 0.9, 650];

go180 = makeGraph[{5, -5, π/180 179.9, 0}, 0.9, 615];

gy180 = makeGraph[{5, -5, π/180 179.9, 0}, 0.9, 590];

gg180 = makeGraph[{5, -5, π/180 179.9, 0}, 0.9, 510];

gb180 = makeGraph[{5, -5, π/180 179.9, 0}, 0.9, 470];

gp180 = makeGraph[{5, -5, π/180 179.9, 0}, 0.9, 410];

gr165 = makeGraph[{5, -5, π/180 165, 0}, 0.9, 650];

go165 = makeGraph[{5, -5, π/180 165, 0}, 0.9, 615];

gy165 = makeGraph[{5, -5, π/180 165, 0}, 0.9, 590];

gg165 = makeGraph[{5, -5, π/180 165, 0}, 0.9, 510];

gb165 = makeGraph[{5, -5, π/180 165, 0}, 0.9, 470];

gp165 = makeGraph[{5, -5, π/180 165, 0}, 0.9, 410];

gr150 = makeGraph[{5, -5, π/180 150, 0}, 0.9, 650];

go150 = makeGraph[{5, -5, π/180 150, 0}, 0.9, 615];

gy150 = makeGraph[{5, -5, π/180 150, 0}, 0.9, 590];

gg150 = makeGraph[{5, -5, π/180 150, 0}, 0.9, 510];

gb150 = makeGraph[{5, -5, π/180 150, 0}, 0.9, 470];

gp150 = makeGraph[{5, -5, π/180 150, 0}, 0.9, 410];

gr135 = makeGraph[{5, -5, π/180 134.9, 0}, 0.9, 650];

go135 = makeGraph[{5, -5, π/180 134.9, 0}, 0.9, 615];

gy135 = makeGraph[{5, -5, π/180 134.9, 0}, 0.9, 590];

gg135 = makeGraph[{5, -5, π/180 134.9, 0}, 0.9, 510];

gb135 = makeGraph[{5, -5, π/180 134.9, 0}, 0.9, 470];

gp135 = makeGraph[{5, -5, π/180 134.9, 0}, 0.9, 410];

gr120 = makeGraph[{5, -5, π/180 120, 0}, 0.9, 650];

go120 = makeGraph[{5, -5, π/180 120, 0}, 0.9, 615];

gy120 = makeGraph[{5, -5, π/180 120, 0}, 0.9, 590];
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gg120 = makeGraph[{5, -5, π/180 120, 0}, 0.9, 510];

gb120 = makeGraph[{5, -5, π/180 120, 0}, 0.9, 470];

gp120 = makeGraph[{5, -5, π/180 120, 0}, 0.9, 410];

gr105 = makeGraph[{5, -5, π/180 105, 0}, 0.9, 650];

go105 = makeGraph[{5, -5, π/180 105, 0}, 0.9, 615];

gy105 = makeGraph[{5, -5, π/180 105, 0}, 0.9, 590];

gg105 = makeGraph[{5, -5, π/180 105, 0}, 0.9, 510];

gb105 = makeGraph[{5, -5, π/180 105, 0}, 0.9, 470];

gp105 = makeGraph[{5, -5, π/180 105, 0}, 0.9, 410];

gr90 = makeGraph[{5, -5, π/180 89.9, 0}, 0.9, 650];

go90 = makeGraph[{5, -5, π/180 89.9, 0}, 0.9, 615];

gy90 = makeGraph[{5, -5, π/180 89.9, 0}, 0.9, 590];

gg90 = makeGraph[{5, -5, π/180 89.9, 0}, 0.9, 510];

gb90 = makeGraph[{5, -5, π/180 89.9, 0}, 0.9, 470];

gp90 = makeGraph[{5, -5, π/180 89.9, 0}, 0.9, 410];
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Show[{tlo, gr180, go180, gy180, gg180, gb180, gp180, gr165, go165, gy165, gg165,
   gb165, gp165, gr150, go150, gy150, gg150, gb150, gp150, gr135, go135, gy135,
   gg135, gb135, gp135, gr120, go120, gy120, gg120, gb120, gp120, gr105,
   go105, gy105, gg105, gb105, gp105, gr90, go90, gy90, gg90, gb90, gp90}]
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