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(* Mathematica notebook for trajetory in linear
 polarized plane wave. Following [Gibbon]'s lecture 3
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*)
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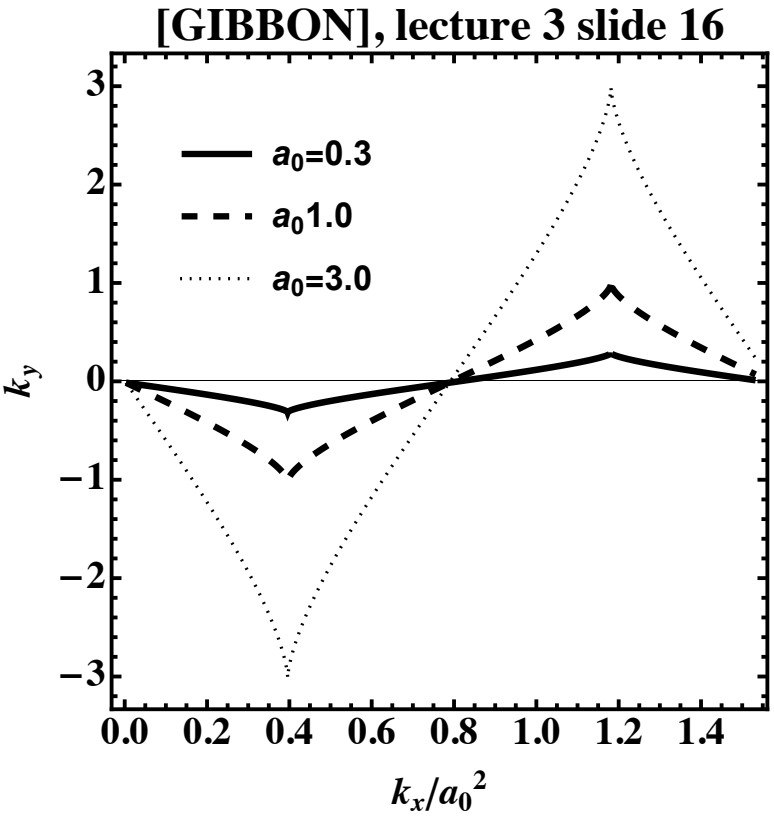
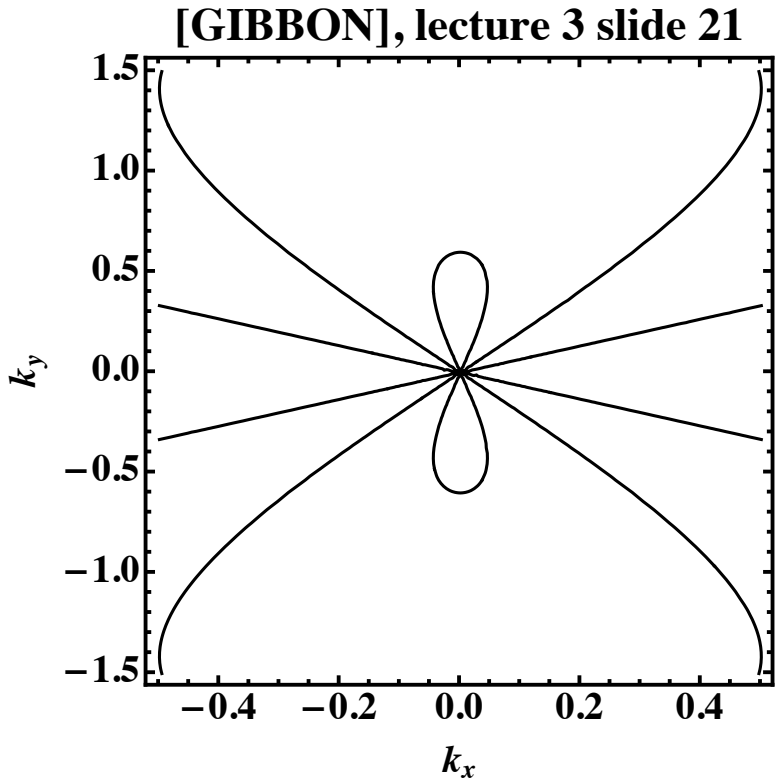
In[•]:=
```
SetOptions[$FrontEndSession, NotebookAutoSave → True]
NotebookSave[]
imgsize = 400;
asp = 1.0;
tck = 0.01;
sz = 30; dsh = 0.05;
```

In[•]:=
```
δ = -1; ω = 1; k = 1; x = 1;
ϕ[t_] := ω * t - k * x
data[a0_] := Module[{tab},
  tab = Table[N[
     {
      1/4 * (ϕ[t] + (2 δ^2 - 1)/2 * Sin[2 * ϕ[t]]),
      δ * a0 * Sin[ϕ[t]]
     }], {t, 1, 7.2, 0.05}];
  Return [tab]
 ]
plt1 = ListLinePlot[
   {data[0.3],
    data[1.0],
    data[3]
   },

   PlotStyle → {
     Directive[Black, Dashing[1], Thickness[tck]],
     Directive[Black, Dashing[dsh / 2], Thickness[tck]],
     Directive[Black, Dotted, Thickness[tck / 2]]
    },
   PlotLabel → "[GIBBON], lecture 3 slide 16",
   LabelStyle → Directive[Bold, FontSize → 20],
   ImageSize → imgsize, AspectRatio → asp,
   Frame → {True, True}, FrameLabel → {"k_x/a_0^2", "k_y"}, FrameStyle → Directive[Thick],
   PlotLegends → Placed[LineLegend[{"a_0=0.3", "a_01.0", "a_0=3.0"},
      LabelStyle → {Black, Bold, 18}, LegendLayout → {"Column", 1}], {0.25, 0.75}]];

q = {0.3, 1.0, 3.0}
plt2 = ContourPlot[
   16 x^2 - y^2 * (4 * q^2 - y^2) == 0, {x, -0.5, 0.5}, {y, -1.5, 1.5},
   ContourStyle → Black,
   PlotLabel → "[GIBBON], lecture 3 slide 21",
   LabelStyle → Directive[Bold, FontSize → 20],
   ImageSize → imgsize, AspectRatio → asp, FrameLabel → {"k_x", "k_y"},
   FrameStyle → Directive[Thick]];

Row[{plt1, plt2}]
```

Out[•]= {0.3, 1., 3.}

Out[•]=


[GIBBON], lecture 3 slide 16
a0=0.3
a01.0
a0=3.0
ky
kx/a0^2
3
2
1
0
−1
−2
−3
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4


[GIBBON], lecture 3 slide 21
ky
kx
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−0.4
−0.2
0.0
0.2
0.4