(*Mathematica 6.0.3.0*)

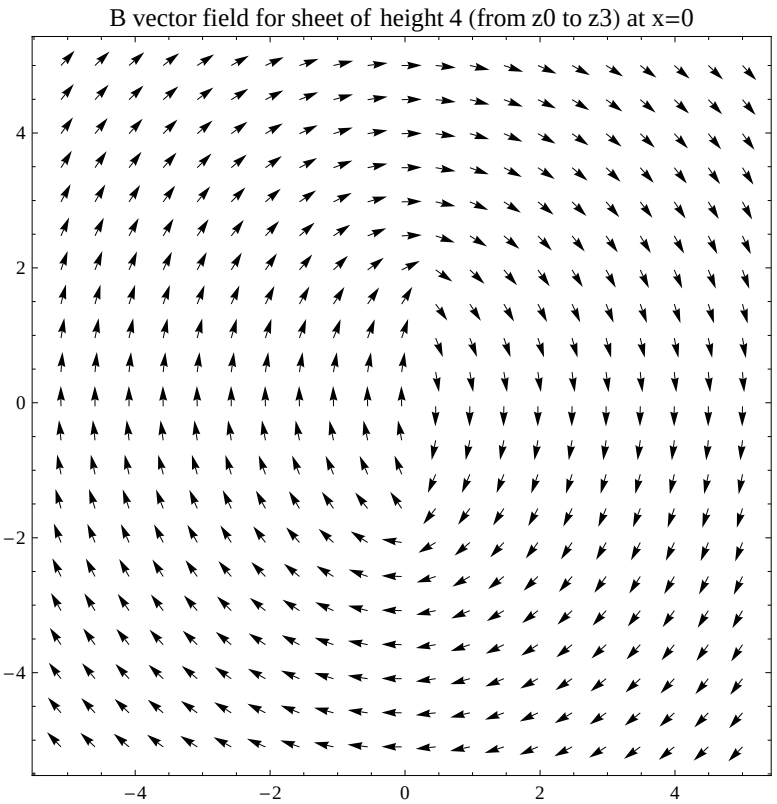
Single current sheet corresponding to one edge of magnetized, infinite Co plate

x1, z0, z3 – x – position and z extent of the current sheet (which is infinite in y – direction)

In[396]:=
```
Bz[x1_, z0_, z3_, x2_, z2_] := mi0 Ms/(2 Pi) (ArcTan[(z3 - z2)/(x1 - x2)] - ArcTan[(z0 - z2)/(x1 - x2)])

Bx[x1_, z0_, z3_, x2_, z2_] :=
  mi0 Ms/(2 Pi) (-1/2 Log[(x1 - x2)^2 + (z3 - z2)^2] + 1/2 Log[(x1 - x2)^2 + (z0 - z2)^2]);
<< VectorFieldPlots`
mul = 0.3;
x1 = 0;
z0 = -2;
z3 = 2;
edge1 = Rectangle[{x1 - 0.1, z0}, {x1 + 0.1, z3}];
a = VectorFieldPlot[
  {mul * Bx[x1, z0, z3, x, z] / (Sqrt[Bx[0, z0, z3, x, z]^2 + Bz[0, z0, z3, x, z]^2]),
   mul * Bz[0, z0, z3, x, z] / (Sqrt[Bx[0, z0, z3, x, z]^2 + Bz[0, z0, z3, x, z]^2])},
  {x, -5.1, 5}, {z, -5.1, 5}, PlotPoints → {21, 21}, ScaleFactor → None,
  MaxArrowLength -> None, Frame → True,
  PlotLabel → "B vector field for sheet of height 4 (from z0 to z3) at x=0"]
```

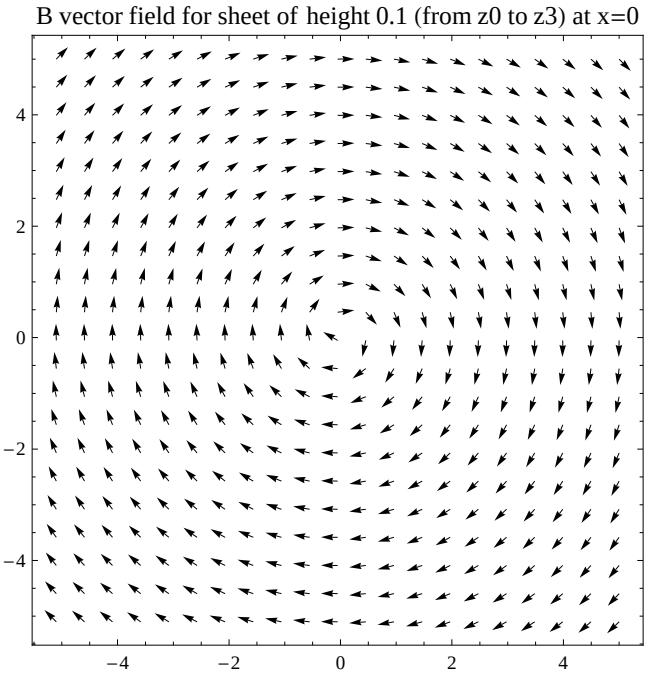
Out[404]=



If the sheet is low (z3 = 0.1) the field is almost circular (as in the case of the field of a single straight wire) :

In[405]:=
```
z0 = 0;
z3 = 0.1;
a = VectorFieldPlot[
  {mul * Bx[x1, z0, z3, x, z] / (Sqrt[Bx[0, z0, z3, x, z]^2 + Bz[0, z0, z3, x, z]^2]),
   mul * Bz[0, z0, z3, x, z] / (Sqrt[Bx[0, z0, z3, x, z]^2 + Bz[0, z0, z3, x, z]^2])},
  {x, -5.1, 5}, {z, -5.1, 5}, PlotPoints → {21, 21}, ScaleFactor → None,
  MaxArrowLength -> None, Frame → True, PlotLabel →
   "B vector field for sheet of height 0.1 (from z0 to z3) at x=0", ImageSize → 300]
```

Out[407]=

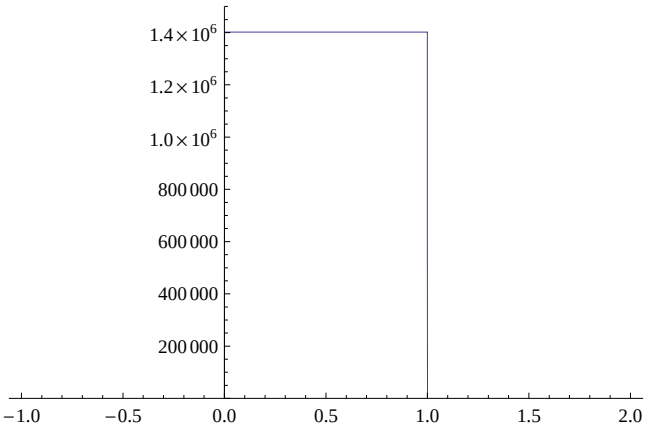


In[408]:= The $\frac{mi0\ Ms}{2\ Pi}$ multiplier corresponds to a saturation magnetization of bulk Co.

Z component of H (not B) (at z = 25) in a narrow (width = 1, height = 50) domain magnetized along z axis :

In[408]:=
```
Plot[(-Bz[0, 0, 50, x, 25] + Bz[1, 0, 50, x, 25]) (1 / mi0),
 {x, -1, 2}, PlotRange -> {0 × 10^6, 1.5 × 10^6}, ImageSize → 300]
(*minus sign in -Bz means that the current in that sheet flows in reversed direction*)
```

Out[408]=



is close to its saturation magnetization Ms.

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