```
(*Line charge distribution and its potential*)
(*potential Function*)
Pot[Q_, x0_, y0_, z0_] := Q / (4 Pi epsilon Sqrt[(x - x0)^2 + (y - y0)^2 + (z - z0)^2]);
(*define list of charges uniform distribution*)
LineCharges = Table[{0.2, x}, {x, -5, 5}]
```

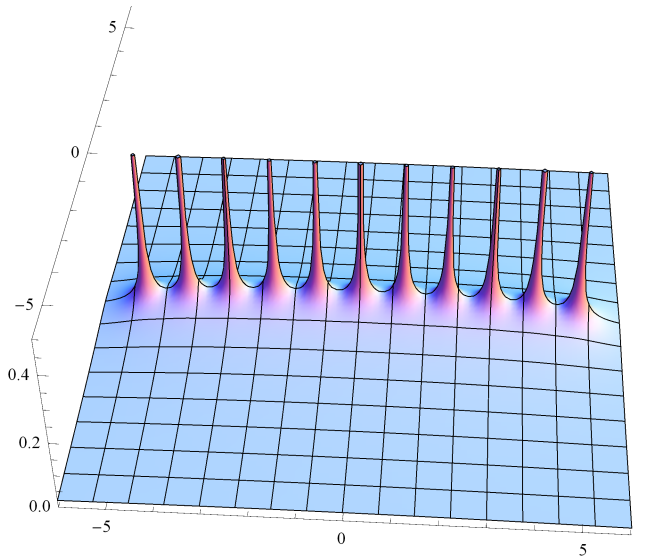
```
{{0.2, -5}, {0.2, -4}, {0.2, -3}, {0.2, -2}, {0.2, -1},
 {0.2, 0}, {0.2, 1}, {0.2, 2}, {0.2, 3}, {0.2, 4}, {0.2, 5}}
```

```
(*Compute the line potential*)
LinePot = 0;
Do[LinePot = LinePot + Pot[LineCharges[[i, 1]], LineCharges[[i, 2]], 0, 0], {i, 1, 11}]
LinePot
```

$$\frac{0.0159155}{\text{epsilon}\sqrt{(-5+x)^2+y^2+z^2}}+\frac{0.0159155}{\text{epsilon}\sqrt{(-4+x)^2+y^2+z^2}}+$$
$$\frac{0.0159155}{\text{epsilon}\sqrt{(-3+x)^2+y^2+z^2}}+\frac{0.0159155}{\text{epsilon}\sqrt{(-2+x)^2+y^2+z^2}}+\frac{0.0159155}{\text{epsilon}\sqrt{(-1+x)^2+y^2+z^2}}+$$
$$\frac{0.0159155}{\text{epsilon}\sqrt{x^2+y^2+z^2}}+\frac{0.0159155}{\text{epsilon}\sqrt{(1+x)^2+y^2+z^2}}+\frac{0.0159155}{\text{epsilon}\sqrt{(2+x)^2+y^2+z^2}}+$$
$$\frac{0.0159155}{\text{epsilon}\sqrt{(3+x)^2+y^2+z^2}}+\frac{0.0159155}{\text{epsilon}\sqrt{(4+x)^2+y^2+z^2}}+\frac{0.0159155}{\text{epsilon}\sqrt{(5+x)^2+y^2+z^2}}$$

```
LinePot = LinePot /. {epsilon → 1, z → 0}
(*Plot3D in xy plane*)
Plot3D[LinePot, {x, -6, 6}, {y, -6, 6},
 PlotRange → {{-6, 6}, {-6, 6}, {0, 0.5}}, PlotPoints → 100, Boxed → False]
```

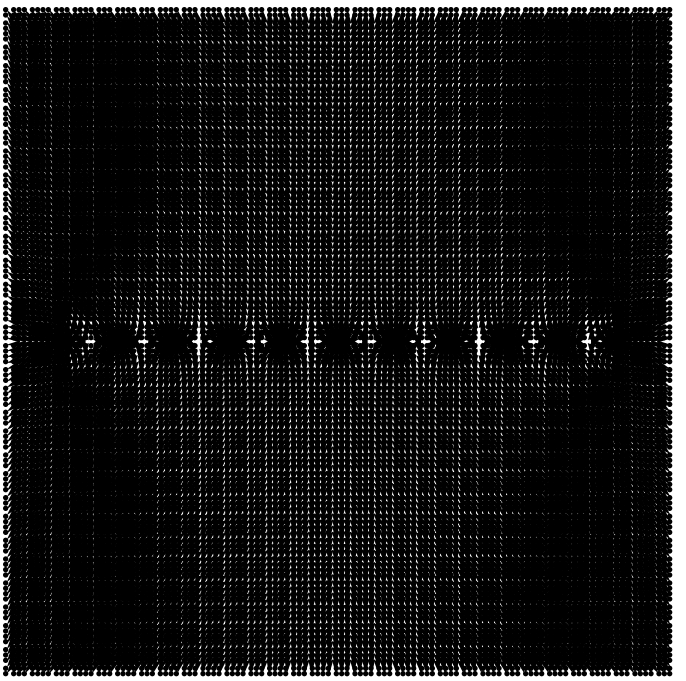
$$\frac{0.0159155}{\sqrt{(-5+x)^2+y^2}}+\frac{0.0159155}{\sqrt{(-4+x)^2+y^2}}+\frac{0.0159155}{\sqrt{(-3+x)^2+y^2}}+$$
$$\frac{0.0159155}{\sqrt{(-2+x)^2+y^2}}+\frac{0.0159155}{\sqrt{(-1+x)^2+y^2}}+\frac{0.0159155}{\sqrt{x^2+y^2}}+\frac{0.0159155}{\sqrt{(1+x)^2+y^2}}+$$
$$\frac{0.0159155}{\sqrt{(2+x)^2+y^2}}+\frac{0.0159155}{\sqrt{(3+x)^2+y^2}}+\frac{0.0159155}{\sqrt{(4+x)^2+y^2}}+\frac{0.0159155}{\sqrt{(5+x)^2+y^2}}$$




```
<< VectorAnalysis`
(*Electric Intensity*)
LineInt = -Grad[LinePot, Cartesian[x, y, z]]
```

$$\left\{\frac{0.0159155\,(-5+x)}{\left((-5+x)^2+y^2\right)^{3/2}}+\frac{0.0159155\,(-4+x)}{\left((-4+x)^2+y^2\right)^{3/2}}+\frac{0.0159155\,(-3+x)}{\left((-3+x)^2+y^2\right)^{3/2}}+\right.$$
$$\frac{0.0159155\,(-2+x)}{\left((-2+x)^2+y^2\right)^{3/2}}+\frac{0.0159155\,(-1+x)}{\left((-1+x)^2+y^2\right)^{3/2}}+\frac{0.0159155\,x}{\left(x^2+y^2\right)^{3/2}}+\frac{0.0159155\,(1+x)}{\left((1+x)^2+y^2\right)^{3/2}}+$$
$$\frac{0.0159155\,(2+x)}{\left((2+x)^2+y^2\right)^{3/2}}+\frac{0.0159155\,(3+x)}{\left((3+x)^2+y^2\right)^{3/2}}+\frac{0.0159155\,(4+x)}{\left((4+x)^2+y^2\right)^{3/2}}+\frac{0.0159155\,(5+x)}{\left((5+x)^2+y^2\right)^{3/2}},$$
$$\frac{0.0159155\,y}{\left((-5+x)^2+y^2\right)^{3/2}}+\frac{0.0159155\,y}{\left((-4+x)^2+y^2\right)^{3/2}}+\frac{0.0159155\,y}{\left((-3+x)^2+y^2\right)^{3/2}}+\frac{0.0159155\,y}{\left((-2+x)^2+y^2\right)^{3/2}}+$$
$$\frac{0.0159155\,y}{\left((-1+x)^2+y^2\right)^{3/2}}+\frac{0.0159155\,y}{\left(x^2+y^2\right)^{3/2}}+\frac{0.0159155\,y}{\left((1+x)^2+y^2\right)^{3/2}}+\frac{0.0159155\,y}{\left((2+x)^2+y^2\right)^{3/2}}+$$
$$\left.\frac{0.0159155\,y}{\left((3+x)^2+y^2\right)^{3/2}}+\frac{0.0159155\,y}{\left((4+x)^2+y^2\right)^{3/2}}+\frac{0.0159155\,y}{\left((5+x)^2+y^2\right)^{3/2}},\,0\right\}$$

```
<< VectorFieldPlots`
VectorFieldPlot[{LineInt[[1]], LineInt[[2]]}, {x, -6, 6, 0.11}, {y, -6, 6, 0.11}]
```



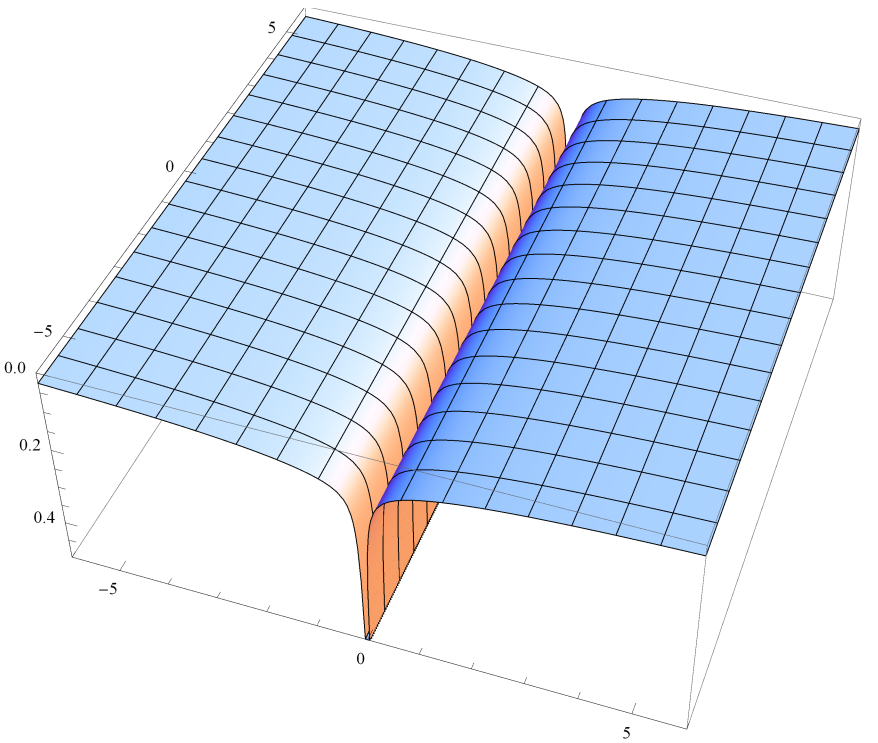
```
(*PROBLEM: Compute and plot potential on two lines parallel to x-
  axis and y intercepts:(-1,1)*)
(*PROBLEM: Compute and plot potential on y-axis*)
(*Line charge distribution and its potential*)
(*Potential Function*)
x =.; y =.;

Pot[Q_, x0_, y0_, z0_] := Q / (4 Pi epsilon Sqrt[(x - x0) ^2 + (y - y0) ^2 + (z - z0) ^2]);
(*Define list of charges uniform distribution*)
LineCharges = Table[{0.2, y}, {y, -5, 5}]
```

```
{{0.2, -5}, {0.2, -4}, {0.2, -3}, {0.2, -2}, {0.2, -1},
 {0.2, 0}, {0.2, 1}, {0.2, 2}, {0.2, 3}, {0.2, 4}, {0.2, 5}}
```

```
(*Compute line potential*)
LinePot = 0;
Do[
  LinePot = LinePot + Pot[LineCharges[[i, 1]], LineCharges[[i, 2]], 0, 0], {i, 1, 11}];
LinePot = LinePot /. {epsilon → 1, z → 0, x → 0}
(*Plot3D in xy-plane*)
Plot3D[LinePot, {x, -6, 6}, {y, -6, 6},
 PlotRange → {{-6, 6}, {-6, 6}, {0, 0.5}}, PlotPoints → 100]
```

$$\frac{0.0159155}{\sqrt{y^2}} + \frac{0.031831}{\sqrt{1+y^2}} + \frac{0.031831}{\sqrt{4+y^2}} + \frac{0.031831}{\sqrt{9+y^2}} + \frac{0.031831}{\sqrt{16+y^2}} + \frac{0.031831}{\sqrt{25+y^2}}$$



```
(*Electric Intensity*)
LineInt = -Grad[LinePot, Cartesian[x, y, z]];

VectorFieldPlot[{LineInt[[1]], LineInt[[2]]}, {x, -6, 6, 0.11}, {y, -6, 6, 0.11}]
```