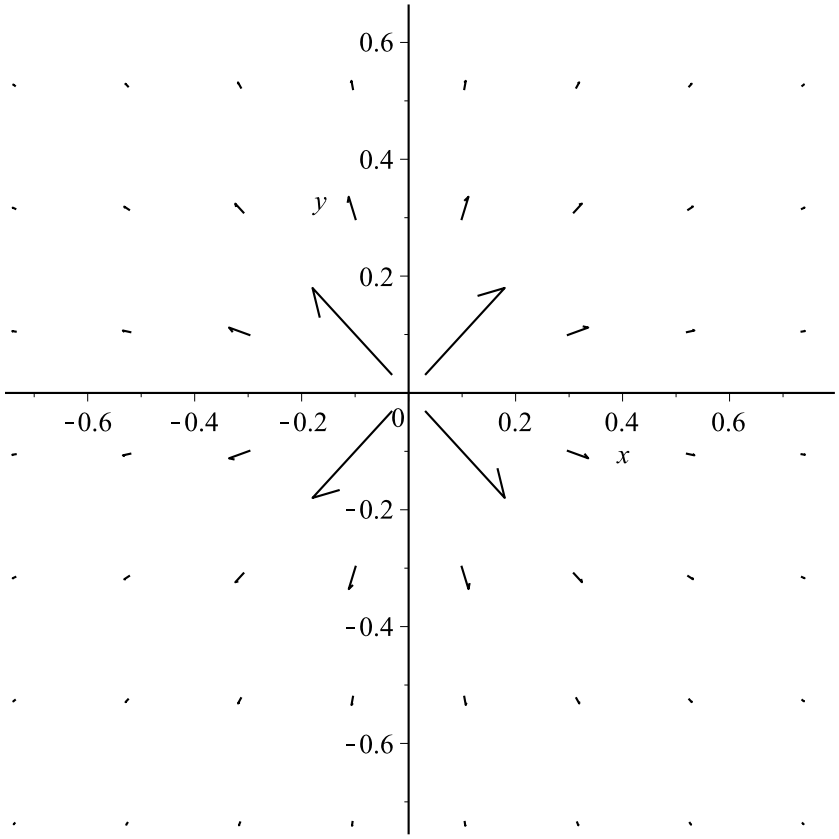
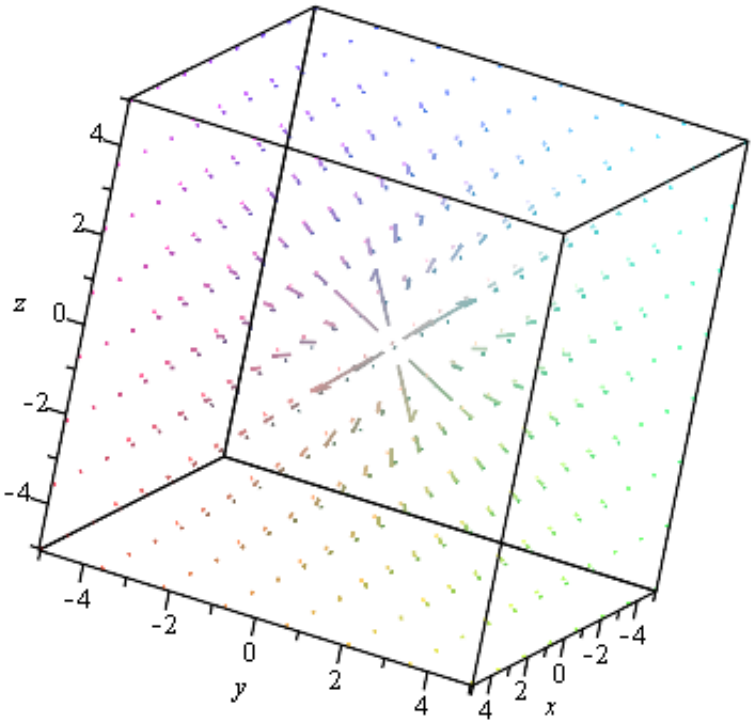
```
> with(plots):
> with(Student[VectorCalculus]):
> fieldplot([x/((x^2+y^2)^(3/2)),y/((x^2+y^2)^(3/2))],x=-2..2,y=-2.
  .2); #Positive Point Charge in 2D
```




```
> G:=VectorField([x/((x^2+y^2+z^2)^(3/2)),y/((x^2+y^2+z^2)^(3/2)),
  z/((x^2+y^2+z^2)^(3/2))]); #Point Charge in 3D
```

$$G := \left(\frac{x}{\left(x^2+y^2+z^2\right)^{3/2}} \right) \bar{e}_x + \left(\frac{y}{\left(x^2+y^2+z^2\right)^{3/2}} \right) \bar{e}_y + \left(\frac{z}{\left(x^2+y^2+z^2\right)^{3/2}} \right) \bar{e}_z \qquad \textbf{(1)}$$

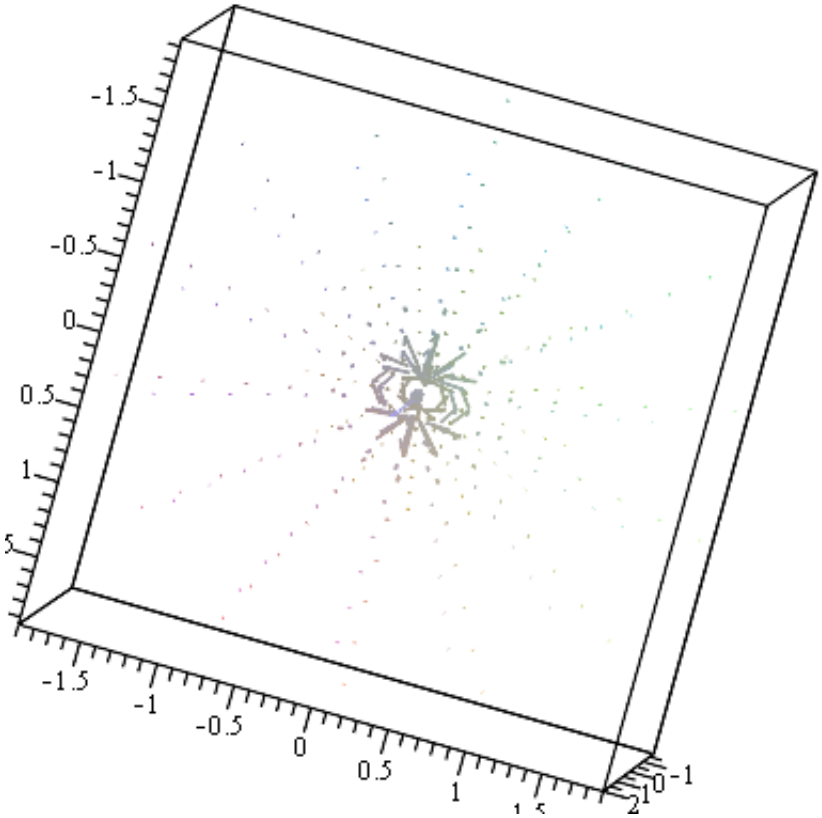
```
> fieldplot3d(G,x=-5..5,y=-5..5,z=-5..5); #Point Charge in 3D
```



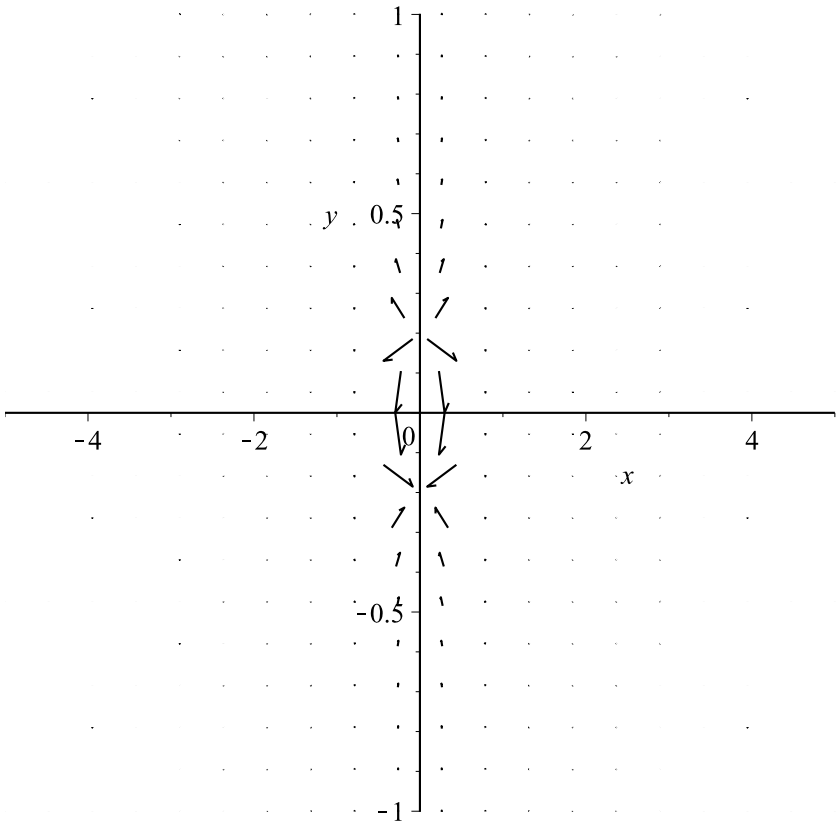

```
> F:=VectorField([2*cos(theta)/(r^3),0,sin(theta)/(r^3)],spherical)
  ; #Electric Dipole in 3D
```

$$F := \frac{2\cos(\theta)}{r^3}\bar{e}_r + \left(\frac{\sin(\theta)}{r^3}\right)\bar{e}_\theta \tag{2}$$

```
> fieldplot3d(F,theta=0..Pi,r=0..2,phi=0..2*Pi); #Electric Dipole
  in 3D
```




```
> fieldplot([3*x*y/(((x^2+y^2))^(5/2)),(2*y^2-x^2)/(((x^2+y^2))^
  (5/2))],x=-5..5,y=-1..1); #Electric Dipole at origin in 2D
```

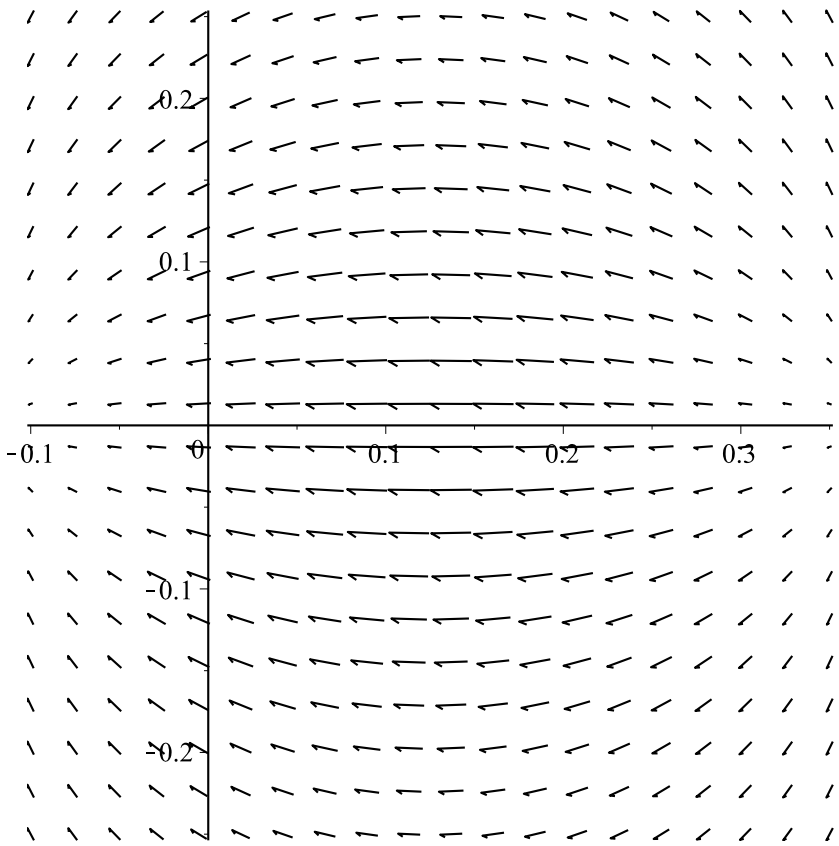



```
> epsilon:=0.1;potential:= 1/sqrt(x^2+y^2+epsilon)-1/sqrt((x-.25)
  ^2+y^2+epsilon); #Alternate way to plot electric dipole in

                #2d, from gradient of potential function

                #Epsilon corrects divide by zero error
```

$$\varepsilon := 0.1$$

$$potential := \frac{1}{\sqrt{x^2+y^2+0.1}} - \frac{1}{\sqrt{(x-0.25)^2+y^2+0.1}} \qquad (3)$$

```
> gradplot(potential, x=-.1..0.35, y=-.25..0.25); #Alternate
  electric dipole in 2D
```




```
> s:=0.1;potential2:=((s^2)/(r^3))*((3*cos(theta)^2)-1); #Electric
  Quadrupole
```

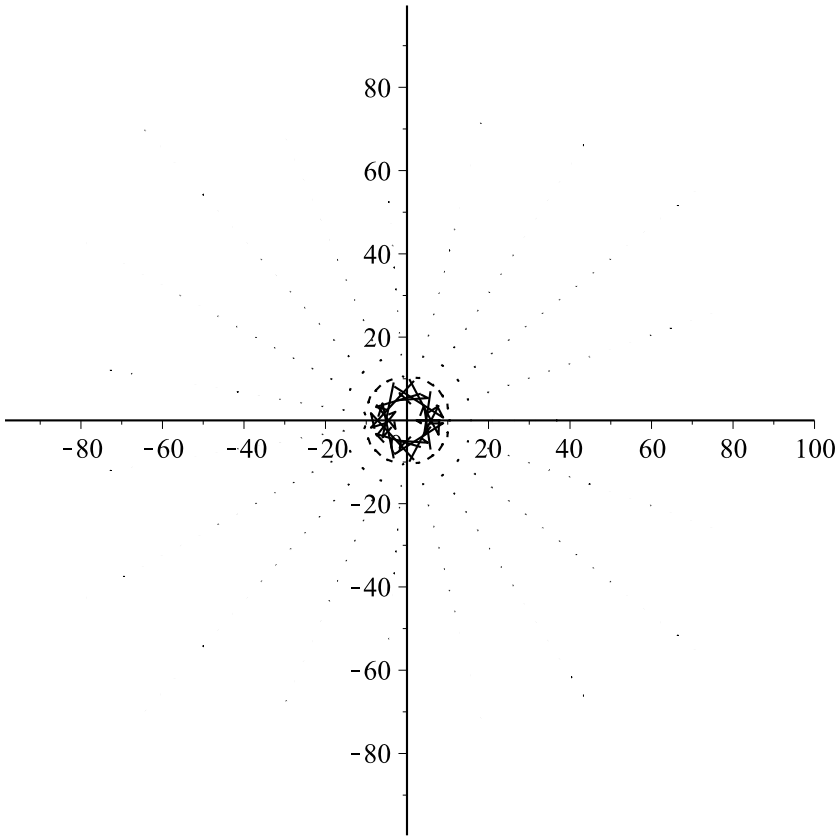
$$s := 0.1$$

$$potential2 := \frac{0.01\left(3\cos(\theta)^2 - 1\right)}{r^3} \tag{4}$$

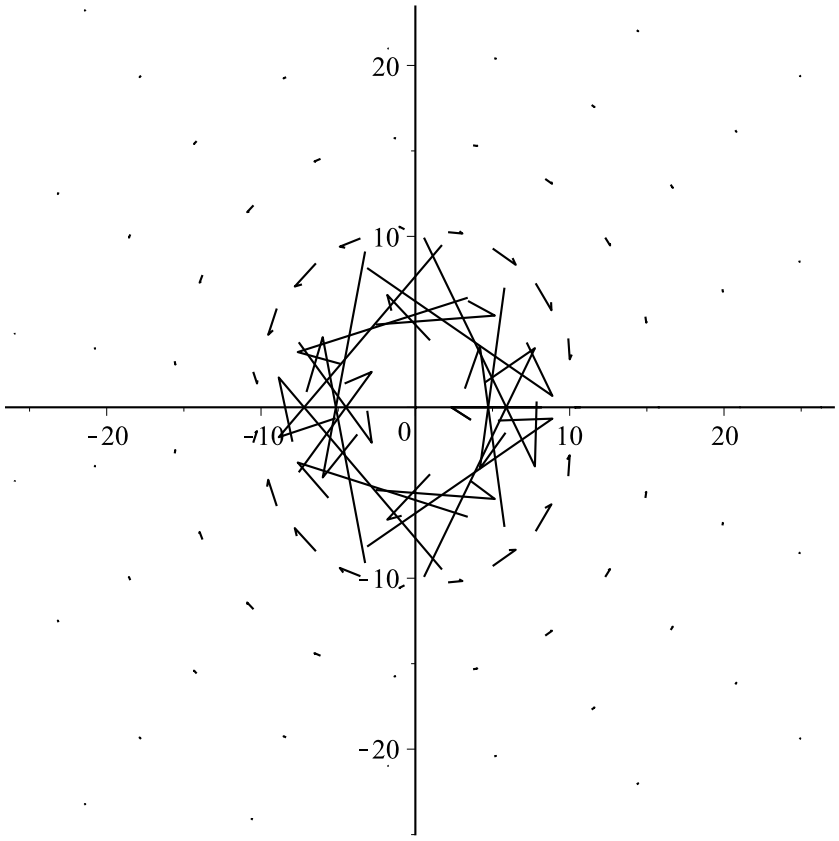
```
> J:=VectorField(Gradient(potential2),polar); #Quadrupole
```

$$J := -\frac{0.03\left(3\cos(\theta)^2 - 1\right)}{r^4}\bar{e}_r - \frac{0.06\cos(\theta)\sin(\theta)}{r^3}\bar{e}_\theta \tag{5}$$

```
> fieldplot(J,theta=0..2*Pi,r=0..100); #Quadrupole
```




```
> fieldplot(J,theta=0..2*Pi,r=0..100); #Quadrupole zoomed in
```


20
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