

```
Clear[F, GradF2D, GradF]
```

```
F[x_, y_, z_] := 1 / Sqrt[x^2 + y^2 + z^2]
```

```
GradF2D[x_, y_] := Evaluate[D[F[x, y, 0], {{x, y}}]]
```

```
(* Evaluate is required to distinguish dummy  
variables for D with dummy variables for GradF2D *)
```

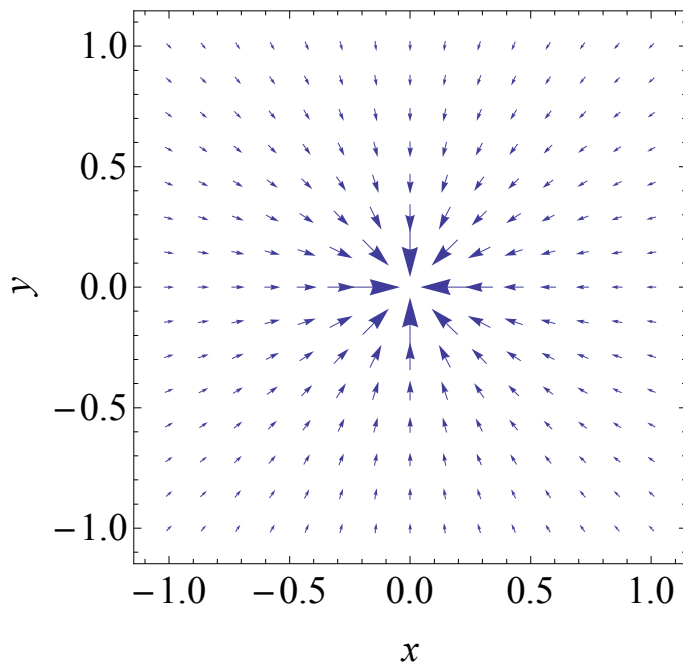
```
GradF2D[x, y]
```

$$\left\{ -\frac{x}{(x^2 + y^2)^{3/2}}, -\frac{y}{(x^2 + y^2)^{3/2}} \right\}$$

```
VectorPlot[GradF2D[x, y], {x, -1, 1}, {y, -1, 1},
```

```
VectorScale -> {Automatic, Medium, If[#5 > 100, 0, #5^0.4] &}, (* #5 is Norm *)
```

```
BaseStyle -> {FontSize -> 20}, FrameLabel -> {x, y}]
```

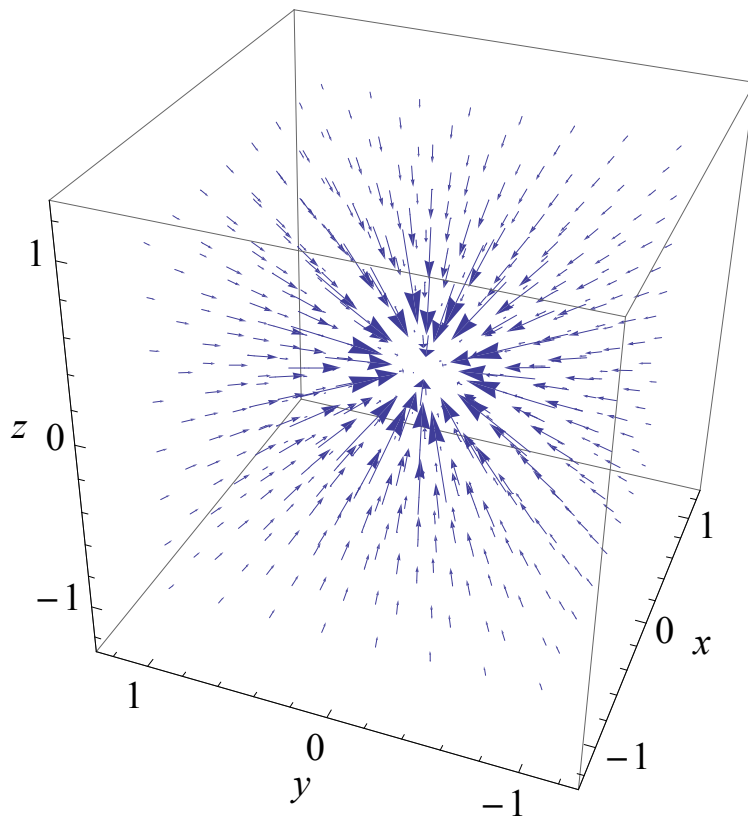


```
GradF[x_, y_, z_] := Evaluate[D[F[x, y, z], {{x, y, z}}]]
```

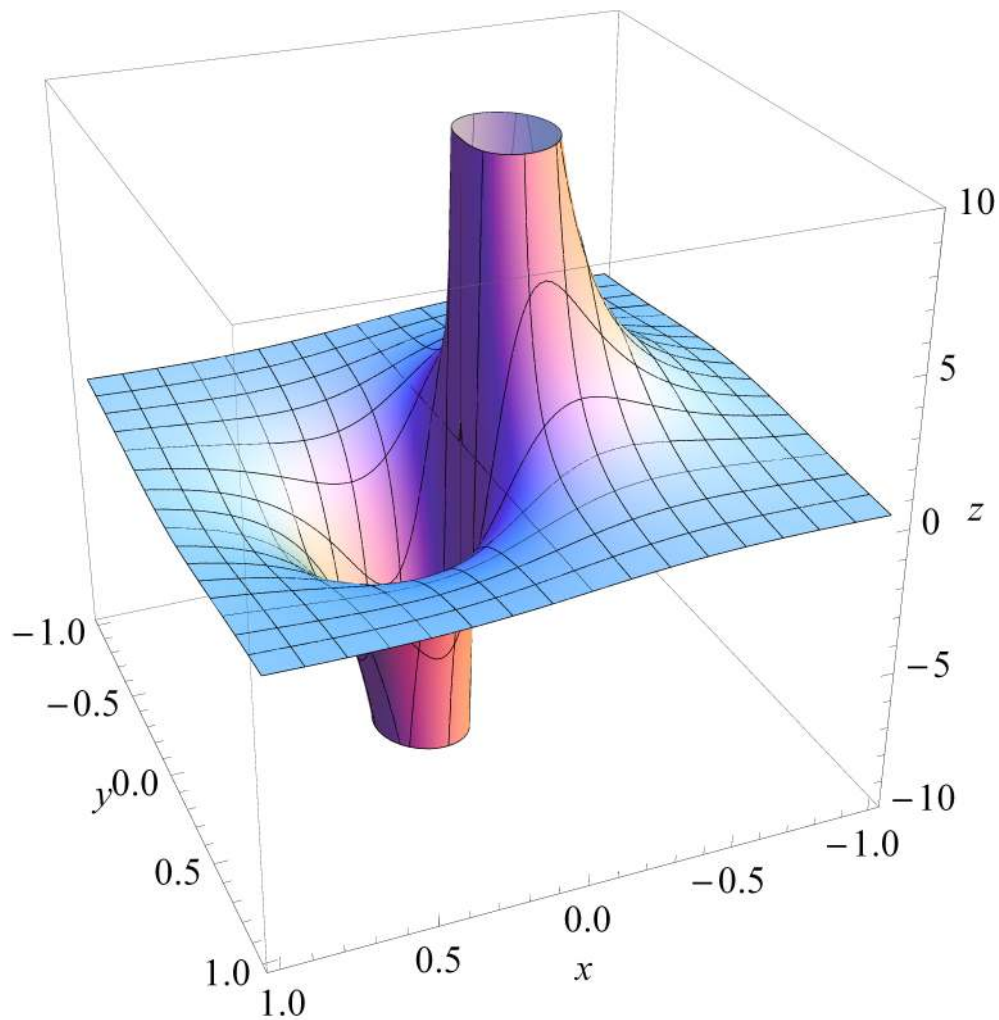
```
GradF[x, y, z]
```

$$\left\{ -\frac{x}{(x^2 + y^2 + z^2)^{3/2}}, -\frac{y}{(x^2 + y^2 + z^2)^{3/2}}, -\frac{z}{(x^2 + y^2 + z^2)^{3/2}} \right\}$$

```
VectorPlot3D[  
  If[ Norm[GradF[x, y, z]] > 10, {0, 0, 0}, GradF[x, y, z]],  
  {x, -1, 1}, {y, -1, 1}, {z, -1, 1},  
  VectorScale -> {Automatic, Small, Automatic},  
  (* #7 is expected to be Norm but not *)  
  BaseStyle -> {FontSize -> 20}, AxesLabel -> {x, y, z}]
```



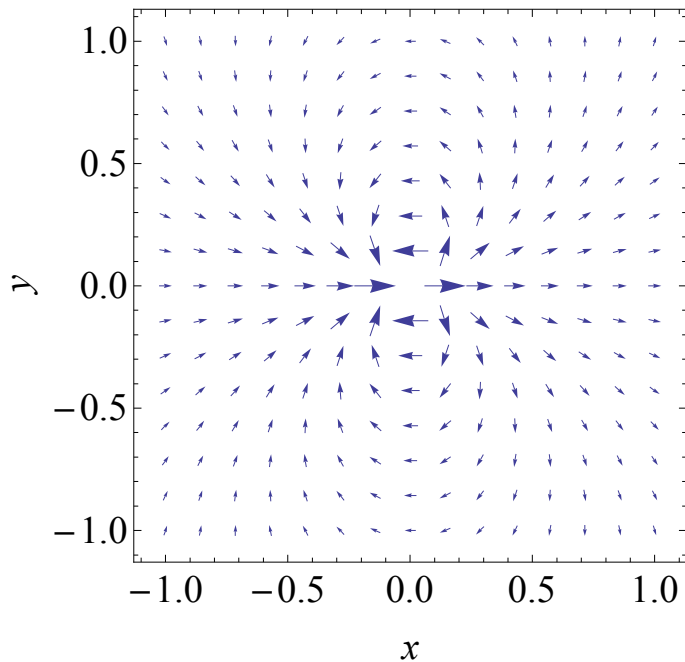
```
Plot3D>(* to avoid spurious at origin, y-coordinate was shifted slightly *)  
GradF[x, y + 0.00001, 0] . {1, 0, 0}, {x, -1, 1}, {y, -1, 1},  
BoxRatios -> 2, PlotRange -> {-10, 10}, ClippingStyle -> Opacity[0.5],  
AxesLabel -> {x, y, z}, ImageSize -> 512,  
BaseStyle -> {FontSize -> 20}, PerformanceGoal -> "Quality",  
PlotPoints -> {101, 101}]
```



```

VectorPlot[
  Evaluate[D[GradF[x, y, 0] . {1, 0, 0}, {{x, y}}] ],
  {x, -1, 1}, {y, -1, 1}, (* #5 is Norm *)
  VectorScale -> {Small, Medium, If[#5 > 1000, 0, #5^0.2] &},
  BaseStyle -> {FontSize -> 20}, FrameLabel -> {x, y}

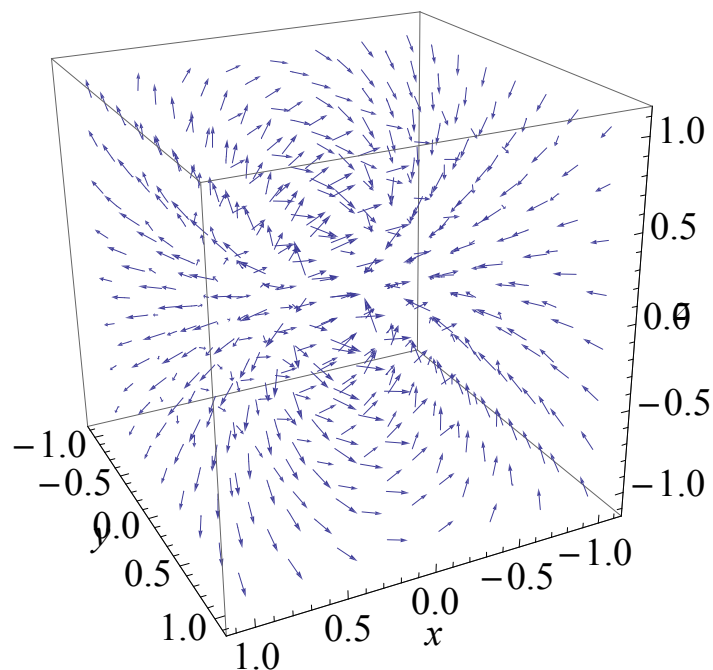
```



```

VectorPlot3D[
  Evaluate[D[GradF[x, y, z] . {1, 0, 0}, {{x, y, z}}] ],
  {x, -1, 1}, {y, -1, 1}, {z, -1, 1},
  VectorScale -> {Small, Small, If[#5 > 20, 0, #5^0.1] &},
  BaseStyle -> {FontSize -> 20}, AxesLabel -> {x, y, z}

```



```
Show[ (* Contour plot for constant electric field is added*)
ContourPlot3D[Abs[GradF[x, y, z] . {1, 0, 0}] = {1/3, 1, 3},
{x, -1, 1}, {y, -1, 1}, {z, -1, 1},
ContourStyle -> Opacity[0.3], Mesh -> None,
BaseStyle -> {FontSize -> 20}, AxesLabel -> {x, y, z}],
VectorPlot3D[
Evaluate[D[GradF[x, y, z] . {1, 0, 0}, {{x, y, z}}]],
{x, -1, 1}, {y, -1, 1}, {z, -1, 1}, VectorStyle -> "Arrow3D",
VectorScale -> {Medium, Medium, If[#5 > 20, 0, #5^0.1] &},
VectorPoints -> {6, 4, 4},
BaseStyle -> {FontSize -> 20}, AxesLabel -> {x, y, z}]]
```

