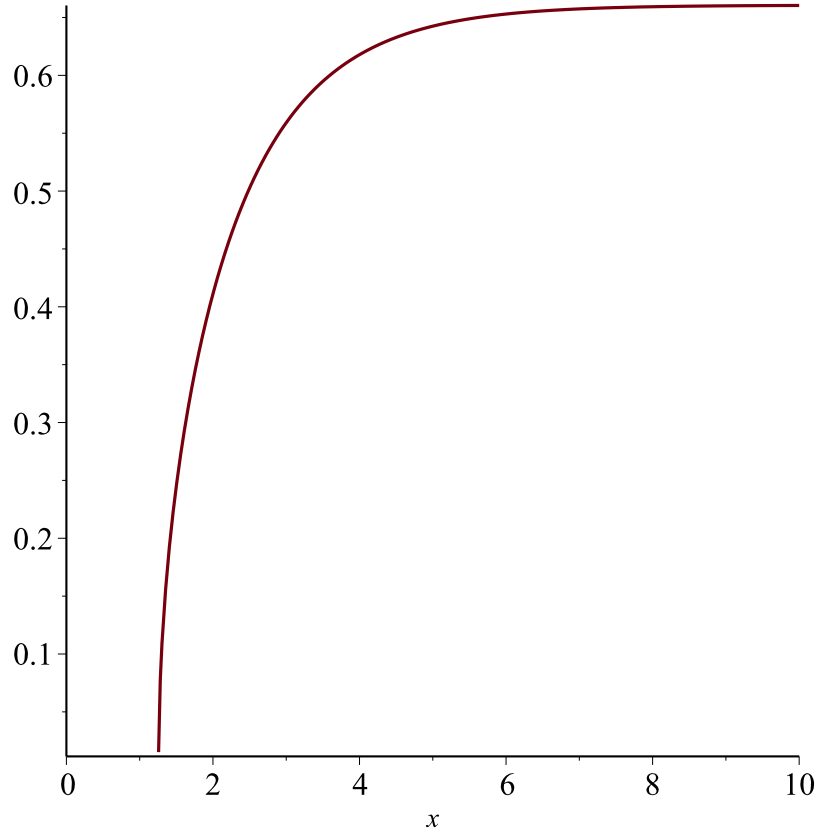
Ad voorbeeld van de slides (slide 1)

```
> f := x -> sqrt(sin(ln(arctan(exp(x)/(x+1)))));
```

$$f := x \to \sqrt{\sin\left(\ln\left(\arctan\left(e^{x}\,\frac{1}{x+1}\right)\right)\right)} \tag{1.1}$$

```
> plot(f(x), x=0..10);
```




```
> diff(f(x), x);
```

$$\frac{1}{2}\,\frac{\cos\left(\ln\left(\arctan\left(\frac{e^{x}}{x+1}\right)\right)\right)\left(\frac{e^{x}}{x+1}-\frac{e^{x}}{(x+1)^{2}}\right)}{\sqrt{\sin\left(\ln\left(\arctan\left(\frac{e^{x}}{x+1}\right)\right)\right)}\left(1+\frac{(e^{x})^{2}}{(x+1)^{2}}\right)\arctan\left(\frac{e^{x}}{x+1}\right)} \tag{1.2}$$

Ad voorbeeld van de slides (slide 7)

```
> restart;
> G := (r, theta) -> f(r*cos(theta), r*sin(theta));
```

(2.1)

$$G := (r, \theta) \rightarrow f(r\cos(\theta), r\sin(\theta)) \tag{2.1}$$

```
> diff(G(r, theta), r);
```

$$D_1(f)\,(r\cos(\theta), r\sin(\theta))\cos(\theta) + D_2(f)\,(r\cos(\theta), r\sin(\theta))\sin(\theta) \tag{2.2}$$

```
> diff(G(r, theta), theta);
```

$$-D_1(f)\,(r\cos(\theta), r\sin(\theta))\,r\sin(\theta) + D_2(f)\,(r\cos(\theta), r\sin(\theta))\,r\cos(\theta) \tag{2.3}$$

```
> diff(G(r, theta), r, r);
```

$$\begin{aligned}&\left(D_{1,1}(f)\,(r\cos(\theta), r\sin(\theta))\cos(\theta) + D_{1,2}(f)\,(r\cos(\theta), r\sin(\theta))\sin(\theta)\right)\cos(\theta)\\&\quad + \left(D_{1,2}(f)\,(r\cos(\theta), r\sin(\theta))\cos(\theta) + D_{2,2}(f)\,(r\cos(\theta),\right.\\&\quad \left.r\sin(\theta))\sin(\theta)\right)\sin(\theta)\end{aligned} \tag{2.4}$$

```
> diff(G(r, theta), r, theta);
```

$$\begin{aligned}&\left(-D_{1,1}(f)\,(r\cos(\theta), r\sin(\theta))\,r\sin(\theta) + D_{1,2}(f)\,(r\cos(\theta),\right.\\&\quad \left.r\sin(\theta))\,r\cos(\theta)\right)\cos(\theta) - D_1(f)\,(r\cos(\theta), r\sin(\theta))\sin(\theta) + \left(\right.\\&\quad \left.-D_{1,2}(f)\,(r\cos(\theta), r\sin(\theta))\,r\sin(\theta) + D_{2,2}(f)\,(r\cos(\theta), r\sin(\theta))\,r\cos(\theta)\right)\\&\quad \sin(\theta) + D_2(f)\,(r\cos(\theta), r\sin(\theta))\cos(\theta)\end{aligned} \tag{2.5}$$

```
> diff(G(r, theta), theta, theta);
```

$$\begin{aligned}&-\left(-D_{1,1}(f)\,(r\cos(\theta), r\sin(\theta))\,r\sin(\theta) + D_{1,2}(f)\,(r\cos(\theta),\right.\\&\quad \left.r\sin(\theta))\,r\cos(\theta)\right)r\sin(\theta) - D_1(f)\,(r\cos(\theta), r\sin(\theta))\,r\cos(\theta) + \left(\right.\\&\quad \left.-D_{1,2}(f)\,(r\cos(\theta), r\sin(\theta))\,r\sin(\theta) + D_{2,2}(f)\,(r\cos(\theta), r\sin(\theta))\,r\cos(\theta)\right)\\&\quad r\cos(\theta) - D_2(f)\,(r\cos(\theta), r\sin(\theta))\,r\sin(\theta)\end{aligned} \tag{2.6}$$

Ad Gradient

```
> with(VectorCalculus);
```

[&x, `*`, `+`, `-`, `.`, <,>, <|>, *About*, *AddCoordinates*, *ArcLength*, *BasisFormat*, *Binormal*, *Compatibility*, *ConvertVector*, *CrossProduct*, *Curl*, *Curvature*, D, *Del*, *DirectionalDiff*, *Divergence*, *DotProduct*, *Flux*, *GetCoordinateParameters*, *GetCoordinates*, *GetNames*, *GetPVDescription*, *GetRootPoint*, *GetSpace*, *Gradient*, *Hessian*, *IsPositionVector*, *IsRootedVector*, *IsVectorField*, *Jacobian*, *Laplacian*, *LineInt*, *MapToBasis*, *Nabla*, *Norm*, *Normalize*, *PathInt*, *PlotPositionVector*, *PlotVector*, *PositionVector*, *PrincipalNormal*, *RadiusOfCurvature*, *RootedVector*, *ScalarPotential*, *SetCoordinateParameters*, *SetCoordinates*, *SpaceCurve*, *SurfaceInt*, *TNBFrame*, *Tangent*, *TangentLine*, *TangentPlane*, *TangentVector*, *Torsion*, *Vector*, *VectorField*, *VectorPotential*, *VectorSpace*, *Wronskian*, *diff*, *eval*, *evalVF*, *int*, *limit*, *series*] (3.1)

```
> with(plots);
```

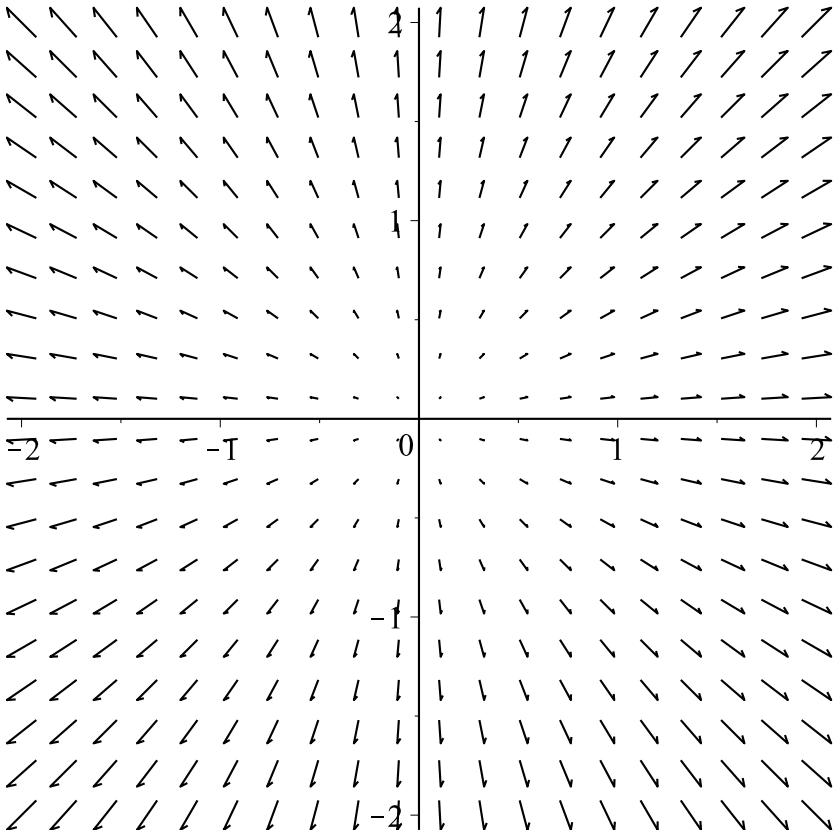
[*animate*, *animate3d*, *animatecurve*, *arrow*, *changecoords*, *complexplot*, *complexplot3d*, *conformal*, *conformal3d*, *contourplot*, *contourplot3d*, *coordplot*, *coordplot3d*, *densityplot*, *display*, *dualaxisplot*, *fieldplot*, *fieldplot3d*, *gradplot*, *gradplot3d*, *implicitplot*, *implicitplot3d*, *inequal*, *interactive*, *interactiveparams*, *intersectplot*, (3.2)

listcontplot, listcontplot3d, listdensityplot, listplot, listplot3d, loglogplot, logplot, matrixplot, multiple, odeplot, pareto, plotcompare, pointplot, pointplot3d, polarplot, polygonplot, polygonplot3d, polyhedra_supported, polyhedraplot, rootlocus, semilogplot, setcolors, setoptions, setoptions3d, spacecurve, sparsematrixplot, surfdata, textplot, textplot3d, tubeplot]

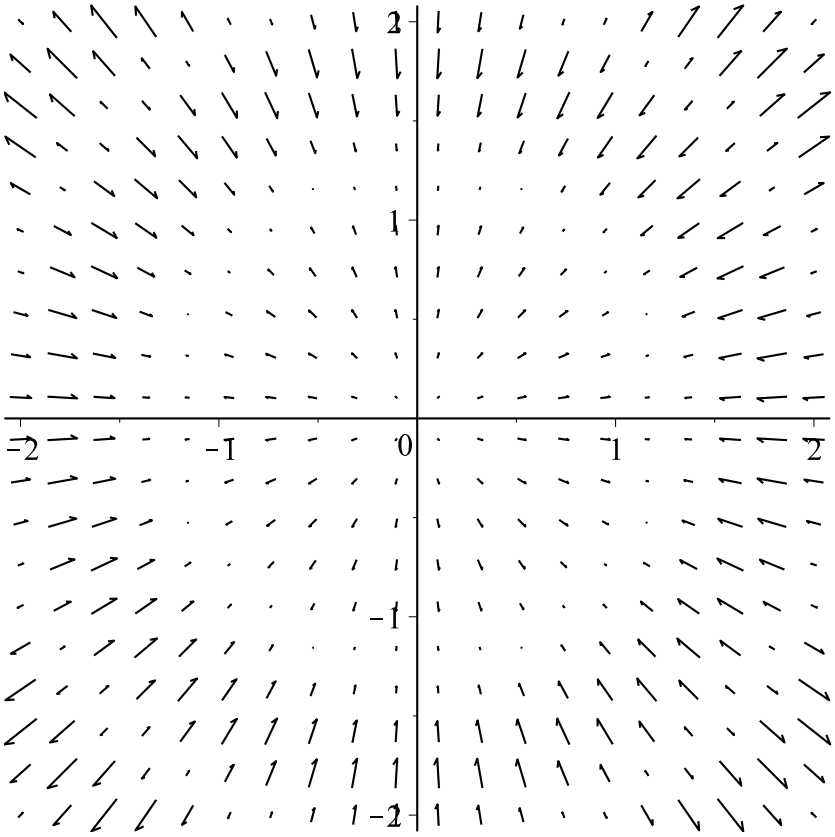
> *Gradient*$\left(x^2+y^2, [x, y]\right)$;

$$2\,x\bar{e}_x + 2\,y\bar{e}_y \qquad \textbf{(3.3)}$$

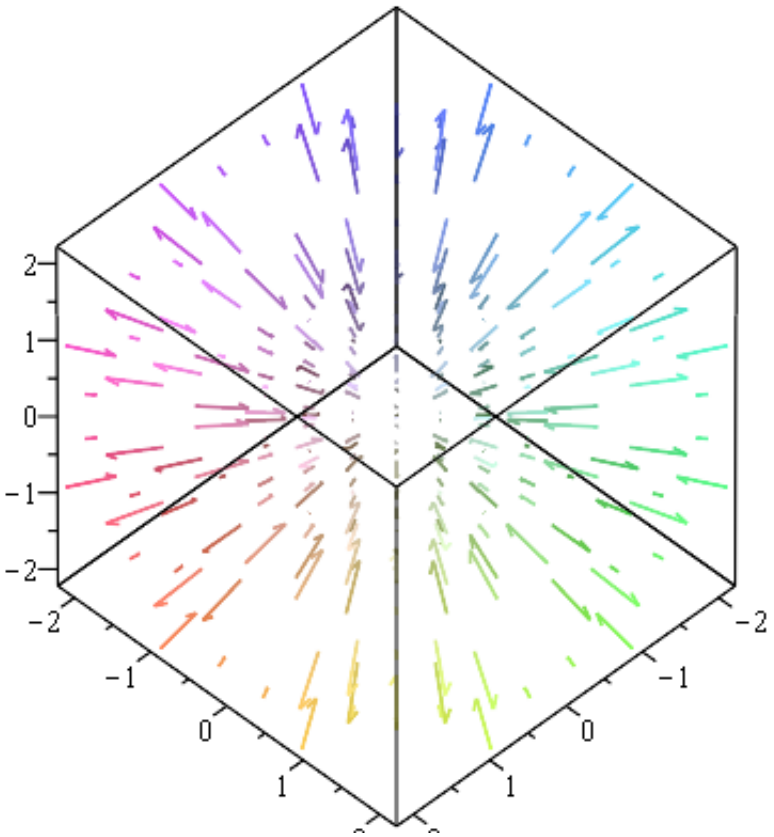
> *gradplot*$\left(\left(x^2+y^2\right), x=-2..2, y=-2..2\right)$;



> *gradplot*$\left(\sin\left(x^2+y^2\right), x=-2..2, y=-2..2\right)$;




```
> gradplot3d(sin(x^2+y^2+z^2)^(1/2), x=-2..2, y=-2..2, z=-2..2);
```


2
1
0
−1
−2
−2
−1
0
1
−2
−1
0
1

>