Ekstraoppgave 12.6.1.

a)

Vi importerer først vektoranalysekommandoene til Maple:

```
> 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] **(1**

Vi starter akkurat som for curlen til et vektorfelt, men det blir litt enklere etterhvert, for divergensen er bare en vanlig skalar funksjon

```
> SetCoordinates('cartesian'[x, y])
```

$$cartesian_{x,\,y} \quad \textbf{(2}$$

```
> F := VectorField(<x^2/(x^2+y^2), y^2/(x^2+y^2)>)
```

$$F := \left(\frac{x^2}{x^2+y^2}\right)\bar{e}_x + \left(\frac{y^2}{x^2+y^2}\right)\bar{e}_y \quad \textbf{(3}$$

```
> g := (x, y) -> Divergence(F)
```

$$g := (x, y) \rightarrow VectorCalculus:\text{-}Divergence(F) \quad \textbf{(4}$$

Vi valgte å lage en funksjon $g(x, y)$ som er lik divergensen. Ulempen er at vi da må skrive $g(x, y)$ for å se hvordan den ser ut:

> g(x, y)

$$\frac{2x}{x^2+y^2} - \frac{2x^3}{(x^2+y^2)^2} + \frac{2y}{x^2+y^2} - \frac{2y^3}{(x^2+y^2)^2} \quad (5$$

> subs(x = 1, y = 0, g(x, y))

$$0 \quad (6$$

> subs(x = -1, y = 2, g(x, y))

$$-\frac{4}{25} \quad (7$$

>

Ekestraoppgave 12.6.2.

a)

> with(VectorCalculus)

[&x, `*`, `+`, `-`, `.`, <,>, <|>, About, AddCoordinates, ArcLength, BasisFormat, Binormal, Compatibility, ConvertVector, (8
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]

> SetCoordinates('cartesian'[x, y, z])

$$cartesian_{x,\,y,\,z} \quad (9$$

> $F := VectorField\left(\left\langle \frac{x \cdot z}{x^2+y^2}, \frac{y \cdot z}{x^2+y^2}, z^4 \right\rangle\right)$

$$F := \left(\frac{x\,z}{x^2+y^2}\right)\bar{e}_x + \left(\frac{y\,z}{x^2+y^2}\right)\bar{e}_y + \left(z^4\right)\bar{e}_z \quad \textbf{(10}$$

```
> g := (x, y, z) -> Divergence(F)
```

$$g := (x, y, z) \to VectorCalculus:\text{-}Divergence(F) \quad \textbf{(11}$$

```
> g(x, y, z)
```

$$\frac{2\,z}{x^2+y^2} - \frac{2\,x^2\,z}{\left(x^2+y^2\right)^2} - \frac{2\,y^2\,z}{\left(x^2+y^2\right)^2} + 4\,z^3 \quad \textbf{(12}$$

```
> subs(x = 1, y = 1, z = 1, g(x, y, z))
```

$$4 \quad \textbf{(13}$$

```
> subs(x = 1, y = 0, z = 0, g(x, y, z))
```

$$0 \quad \textbf{(14}$$

```
> subs(x = -1, y = 2, z = 3, g(x, y, z))
```

$$108 \quad \textbf{(15}$$

```
>
```