Program:

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from sympy import symbols, sin
from sympy.galgebra.printer import Format, xpdf
from sympy.galgebra.ga import Ga

Format()

print r'#\newline Normalized Spherical Coordinates:'
sph_coords = (r, th, phi) = symbols('r theta phi', real=True)
sp3d = Ga('e', g=[1, r**2, r**2 * sin(th)**2], coords=sph_coords, norm=True)
f = sp3d.mv('f', 'scalar', f=True)
F = sp3d.mv('F', 'vector', f=True)
lap = sp3d.grad*sp3d.grad

print 'g =', sp3d.g
print r'%\nabla =', sp3d.grad
print r'%\nabla^{2} =', lap
print r'%\lp\nabla^{2}\rp f =', lap*f
print r'%\nabla\cdot\lp\nabla f\rp =', sp3d.grad | (sp3d.grad * f)
print 'F =', F
print r'%\nabla\cdot F =', sp3d.grad | F


print '#Unnormalized Spherical Coordinates:'

sp3du = Ga('e', g=[1, r**2, r**2 * sin(th)**2], coords=sph_coords)
f = sp3du.mv('f', 'scalar', f=True)
F = sp3du.mv('F', 'vector', f=True)
lap = sp3du.grad*sp3du.grad
print 'g =', sp3du.g
print r'%\nabla =', sp3du.grad
print r'%\nabla^{2} =', lap
print r'%\lp\nabla^{2}\rp f =', (lap*f).trigsimp()
print r'%\nabla\cdot\lp\nabla f\rp =', sp3du.grad | (sp3du.grad * f)
print r'%\nabla\cdot\nabla =', sp3du.grad | sp3du.grad
print 'F =', F
print r'%\nabla\cdot F =', sp3du.grad | F

xpdf(paper='landscape',prog=True)
```

Code Output:

Normalized Spherical Coordinates:

$$g = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\nabla = e_r \frac{\partial}{\partial r} + e_\theta \frac{1}{r} \frac{\partial}{\partial \theta} + e_\phi \frac{1}{r \sin{(\theta)}} \frac{\partial}{\partial \phi}$$

$$\nabla^2 = \frac{2}{r} \frac{\partial}{\partial r} + \frac{\cos{(\theta)}}{r^2 \sin{(\theta)}} \frac{\partial}{\partial \theta} + \frac{\partial^2}{\partial r^2} + r^{-2} \frac{\partial^2}{\partial \theta^2} + \frac{1}{r^2 \sin^2{(\theta)}} \frac{\partial^2}{\partial \phi^2}$$

$$\left(\nabla^2\right) f = \frac{1}{r^2} \left(r^2 \partial_r^2 f + 2r \partial_r f + \partial_\theta^2 f + \frac{\partial_\theta f}{\tan{(\theta)}} + \frac{\partial_\phi^2 f}{\sin^2{(\theta)}}\right)$$

$$\nabla \cdot (\nabla f) = \frac{1}{r^2} \left(r^2 \partial_r^2 f + 2r \partial_r f + \partial_\theta^2 f + \frac{\partial_\theta f}{\tan{(\theta)}} + \frac{\partial_\phi^2 f}{\sin^2{(\theta)}}\right)$$

$$F = F^r e_r + F^\theta e_\theta + F^\phi e_\phi$$

$$\nabla \cdot F = \frac{1}{r} \left(r \partial_r F^r + 2F^r + \frac{F^\theta}{\tan{(\theta)}} + \partial_\theta F^\theta + \frac{\partial_\phi F^\phi}{\sin{(\theta)}}\right)$$

Unnormalized Spherical Coordinates:

$$g = \begin{bmatrix} 1 & 0 & 0 \\ 0 & r^2 & 0 \\ 0 & 0 & r^2 \sin^2{(\theta)} \end{bmatrix}$$

$$\nabla = e_r \frac{\partial}{\partial r} + e_\theta r^{-2} \frac{\partial}{\partial \theta} + e_\phi \frac{1}{r^2 \sin^2{(\theta)}} \frac{\partial}{\partial \phi}$$

$$\nabla^2 = \frac{2}{r} \frac{\partial}{\partial r} + \frac{1}{r^2 \tan{(\theta)}} \frac{\partial}{\partial \theta} + \frac{\partial^2}{\partial r^2} + r^{-2} \frac{\partial^2}{\partial \theta^2} + \frac{1}{r^2 \sin^2{(\theta)}} \frac{\partial^2}{\partial \phi^2} + e_\theta \wedge e_\phi \left(\frac{\sin{(2\theta)}}{2r^4 \sin^4{(\theta)}} + \frac{1}{r^4 \sin^2{(\theta)} \tan{(\theta)}} - \frac{2\cos{(\theta)}}{r^4 \sin^3{(\theta)}}\right) \frac{\partial}{\partial \phi}$$

$$\left(\nabla^2\right) f = \frac{1}{r^2} \left(r^2 \partial_r^2 f + 2r \partial_r f + \partial_\theta^2 f + \frac{\partial_\theta f}{\tan{(\theta)}} + \frac{\partial_\phi^2 f}{\sin^2{(\theta)}}\right)$$

$$\nabla \cdot (\nabla f) = \frac{1}{r^2} \left(r^2 \partial_r^2 f + 2r \partial_r f + \partial_\theta^2 f + \frac{\partial_\theta f}{\tan{(\theta)}} + \frac{\partial_\phi^2 f}{\sin^2{(\theta)}}\right)$$

$$\nabla \cdot \nabla = \frac{2}{r} \frac{\partial}{\partial r} + \frac{1}{r^2 \tan{(\theta)}} \frac{\partial}{\partial \theta} + \frac{\partial^2}{\partial r^2} + r^{-2} \frac{\partial^2}{\partial \theta^2} + \frac{1}{r^2 \sin^2{(\theta)}} \frac{\partial^2}{\partial \phi^2}$$

$$F = F^r e_r + F^\theta e_\theta + F^\phi e_\phi$$

$$\nabla \cdot F = \frac{F^\theta}{\tan{(\theta)}} + \partial_\phi F^\phi + \partial_r F^r + \partial_\theta F^\theta + \frac{2F^r}{r}$$