Program:

```
import sys
from sympy import symbols,sin
from printer import Format,xpdf
from ga import Ga

Format()
X = (r,th,phi) = symbols('r theta phi')
s3d = Ga('e_r e_theta e_phi',g=[1,r**2,r**2*sin(th)**2],coords=X,norm=True)
(er,eth,ephi) = s3d.mv()
grad = s3d.grad

f = s3d.mv('f','scalar',f=True)
A = s3d.mv('A','vector',f=True)
B = s3d.mv('B','bivector',f=True)

print 'f =',f
print 'A =',A
print 'B =',B

print 'grad*f =',grad*f
print 'grad|A =',grad|A
print '-I*(grad^A) =',(-s3d.i*(grad^A)).simplify()
print 'grad^B =',grad^B
print r'%\nabla\cdot\lp\nabla f\rp =', s3d.grad|(s3d.grad*f)
xpdf(paper='letter',prog=True)
```

Code Output:

$$f = f$$

$$A = A^{r}\boldsymbol{e_r} + A^{\theta}\boldsymbol{e_\theta} + A^{\phi}\boldsymbol{e_\phi}$$

$$B = B^{r\theta}\boldsymbol{e_r}\wedge\boldsymbol{e_\theta} + B^{r\phi}\boldsymbol{e_r}\wedge\boldsymbol{e_\phi} + B^{\phi\phi}\boldsymbol{e_\theta}\wedge\boldsymbol{e_\phi}$$

$$\boldsymbol{\nabla} f = \partial_r f\boldsymbol{e_r} + \frac{1}{r}\partial_\theta f\boldsymbol{e_\theta} + \frac{\partial_\phi f}{r\sin(\theta)}\boldsymbol{e_\phi}$$

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

$$-I(\boldsymbol{\nabla}\wedge A) = \frac{1}{r}\left(\frac{A^\phi}{\tan(\theta)} + \partial_\theta A^\phi - \frac{\partial_\phi A^\theta}{\sin(\theta)}\right)\boldsymbol{e_r} + \frac{1}{r}\left(-r\partial_r A^\phi - A^\phi + \frac{\partial_\phi A^r}{\sin(\theta)}\right)\boldsymbol{e_\theta} + \frac{1}{r}\left(r\partial_r A^\theta + A^\theta - \partial_\theta A^r\right)\boldsymbol{e_\phi}$$

$$\boldsymbol{\nabla}\wedge B = \frac{1}{r}\left(r\partial_r B^{\phi\phi} - \frac{B^{r\phi}}{\tan(\theta)} + 2B^{\phi\phi} - \partial_\theta B^{r\phi} + \frac{\partial_\phi B^{r\theta}}{\sin(\theta)}\right)\boldsymbol{e_r}\wedge\boldsymbol{e_\theta}\wedge\boldsymbol{e_\phi}$$

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