$h(x,y,z) = \cos(xy) + e^{yz} + \ln(zx)$

$P_0(1, 0, 1/2) \quad \vec{u} = (1, 2, 2)$

$D_v h(P_0) = \nabla h(P_0) \cdot v$

$\|\vec{u}\| = 3 \rightarrow \vec{v} = \frac{\vec{u}}{\|\vec{u}\|} = (1/3, 2/3, 2/3)$

$h_x(x,y,z) = \left(-\sin(xy) \cdot y + \frac{1}{zx} \cdot z\right)$

$= \left(-y\sin(xy) + \frac{1}{x}\right)$

$h_x(1, 0, 1/2) = 1$

$h_y(x,y,z) = \left(-\sin(xy) \cdot x + e^{yz} \cdot z\right)$

$= -x\sin(xy) + ze^{yz}$

$h_y(1, 0, 1/2) = 1/2$

$h_z(x,y,z) = e^{yz} \cdot y + \frac{1}{zx} x$

$= ye^{yz} + \frac{1}{z}$

$h_z(1, 0, 1/2) = 2$

$\nabla \cancel{f}h(1, 0, 1/2) = (1, 1/2, 2)$

$D_v h(P_0) = (1, 1/2, 2) \cdot (1/3, 2/3, 2/3) =$