$dz = \frac{\partial z}{\partial x} dx + \frac{\partial z}{\partial y} dy$

$f_x = 3x^2 - 2y$ $\quad f_y = 3y^2 - 2x$ $\quad dx = 0.04$ $\quad dy = -0.05$

$dz = [3(2)^2 - 2(3)]0.04 + [3(3)^2 - 2(2)](-0.05)$

$= 6(0.04) + 23(-0.05) = 0.24 - 1.15 = -0.91$ $\quad \boxed{dz = -0.91}$

5: $dx/dy$ $\quad x^2 + y^2 = 4xy$ $\quad x^2 + y^2 - 4xy = 0$

$\frac{dx}{dy} = -\frac{f_y}{f_x}$ $\quad f_x = 2x - 4y$ $\quad f_y = 2y - 4x$ $\quad \frac{dx}{dy} = -\frac{2x-4y}{2y-4x} = -\frac{x-2y}{y-2x}$

$\boxed{\frac{dy}{dx} = -\frac{x-2y}{y-2x}}$

6: $f(x,y,z) = x\sin(y)\cos(z)$ $\quad P(1,0,0)$

$f_x = \sin(y)\cos(z)$ $\quad f_y = x\cos(y)\cos(z)$ $\quad f_z = -x\sin(y)\sin(z)$

$\nabla f = \begin{bmatrix} \sin(y)\cos(z) \\ x\cos(y)\cos(z) \\ -x\sin(y)\sin(z) \end{bmatrix}$ $\quad v = \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$ $\quad |v| = \sqrt{1^2 + 2^2 + (-1)^2} = \sqrt{1+4+1} = \sqrt{6}$

$\hat{v} = \begin{bmatrix} 1/\sqrt{6} \\ 2/\sqrt{6} \\ -1/\sqrt{6} \end{bmatrix}$ $\quad \nabla f(1,0,0) = \begin{bmatrix} \sin(0)\cos(0) \\ (1)\cos(0)\cos(0) \\ -(1)\sin(0)\sin(0) \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$

$D_{\hat{v}}(1,0,0) = \nabla f(1,0,0) \cdot \hat{v} = \begin{bmatrix} 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} 1/\sqrt{6} \\ 2/\sqrt{6} \\ -1/\sqrt{6} \end{bmatrix} = 2/\sqrt{6}$

$\boxed{D_{\hat{v}}(1,0,0) = 2/\sqrt{6}}$