Partial Derivative

1. Let $f(x) = 3x^3y^2$. Find $f_x, f_y, f_x(x,1), f_y(1,y), f_x(1,2), f_y(1,2)$.
2. Find the slope of the surface $z = f(x,y)$ along x-direction and y-direction at the points $(3,0)$ and $(4,2)$ for the following functions:
   (i) $f(x,y) = xe^{-y} + 5y$
   (ii) $f(x,y) = \sqrt{3x+2y}$.
3. Find $f_{xx}, f_{yy}, f_{xy}, f_{yx}$ for the functions below:
   (i) $f(x,y) = 4x^2 - 2y + 7x^4y^5$
   (ii) $f(x,y) = e^{x^2+xy+y^2}$.
4. Find the rate of change of z with respect to x and with respect to y at the points $(2,1)$ and $(-2,4)$ for the following functions:
   (i) $z = \sin(y^2 - 4x)$
   (ii) $z = (x+y)^{-1}$.
5. Find $f_{xy}, f_{yz}, f_{xz}, f_{zz}, f_{zyy}, f_{zxy}, f_{zyx}, f_{xxyz}$ for $f(x,y,z) = x^3y^5z^7 + xy^2 + y^3z$.
6. Compute $f_x, f_z, f_{xy}, f_{xyz}$ for $f(x,y,z) = \sqrt{xy} + \ln(x^2z^3) - x\tan z$.
7. Let $f(x,y,z) = (\mathrm{x}^2 - \mathrm{y}^2)\cos x + x^5z^2 - 30z$. Find f_{xy}, f_{xxz}, f_{zyx}.
8. Let $f(x,y) = x^3\ln(x^2y) + x^4y - e^{3x}x^2$. Find $f_{xy}, f_{xx}, f_{yy}, f_{yx}$.