Chapter one, Assignment 2

1. Compute the partial derivatives with respect to x and with respect to y for the following fuctions.

   a. $f(x,y) = y^2 e^{3x}$ b. $z = (3xy + 2x)^5$ c. $g(x,y) = e^{x+3y} sin(xy)$

2. Let $f(x,y) = \dfrac{x^2}{y+1}$. Find $f_y(3,2)$ algebraically.

   Find the indicated partial derivatives for the following problems. Assume the variable are restricted to a domain on which the function is defined.

3. z_y if $z = \dfrac{3x^2y^7 - y^2}{15xy - 8}$

4. z_x if $z = \dfrac{1}{2x^2ay} + \dfrac{3x^5abc}{y}$

5. $\dfrac{\partial}{\partial \lambda}\left(\dfrac{x^2y\lambda - 3\lambda^5}{\sqrt{\lambda^2 - 3\lambda + 5}}\right)$

6. $\dfrac{\partial}{\partial w}\left(\sqrt{2\pi xyw - 13x^7y^3v}\right)$

7. $\dfrac{\partial \alpha}{\partial \beta}$ if $\alpha = \dfrac{e^{x\beta - 3}}{2y\beta + 5}$

8. $\dfrac{\partial}{\partial w}\left(\dfrac{x^2yw - xy^3w^7}{w-1}\right)^{\frac{-7}{2}}$

9. Find the equation of the tangent plane at the given point for the functions below.

   a. $z = e^y + x + x^2 + 6$ at the point $(1, 0, 9)$

   b. $z = \frac{1}{2}(x^2 + 4y^2)$ at the point $(2, 1, 4)$.

10. Find the differential of $h(x,t) = e^{-3t}\sin(x + 5t)$

11. Find the differential of $g(x,t) = x^2 \sin(2t)$ at the point $(2, \frac{\pi}{4})$

12. Find $\dfrac{\partial z}{\partial u}$ and $\dfrac{\partial z}{\partial v}$ of $z = xe^{-y} + ye^{-x}, x = u\sin v, y = v\cos u$

13. Find $\dfrac{dz}{dt}$ of $z = \sin(\frac{x}{y}), x = 2t, y = 1 - t^2$ using the chain rule.

    Calculate all the four second-order partial derivatives of the functions below and show that $f_{xy} = f_{yx}$.

14. $f(x,y) = \sin(x^2 + y^2)$

15. $f(x,y) = \sin(\frac{x}{y})$