Practicing Partial and Anti-Partial Derivatives

1. Let $f(x,y) = 3xy^3 + 2x^2y$
   a. Find f_x

   b. Find $\frac{\partial^2 f}{\partial x \partial y}$

   c. Compute ∇f

2. Let $g(x,y,z) = xy\tan(\mathrm{x}^2\mathrm{y}^3\mathrm{z}^4)$. Compute ∇g

3. Consider $h(x,y,z,w) = 2xy - 3yz + 4zw - 5xw$. Compute h_{xyzw}

4. Let $f(x,y) = \frac{xy\sin(xy)}{\cos(xy)}$. Find f_x and f_y

5. Consider $f(x,y) = \frac{x}{y}$. Find f_{xx}, f_{yy}, f_{xy}, and f_{yx} and confirm that $f_{xy} = f_{yx}$

6. Compute $\iint 2xy^2 + 3x^2y\,dx\,dy$

7. Find $\int_1^2 \int_{\ln(2)}^{\ln(3)} xe^y\,dy\,dx$

8. Compute $\int_0^1 \int_0^2 \int_0^3 xy + yz + xz\ \ dx\,dy\,dz$

9. Find $\int_0^2 \int_1^3 6xy^2\,dy\,dx$ and $\int_1^3 \int_0^2 6xy^2\,dx\,dy$

10. Evaluate $\int_e^{e^2} \int_0^1 \frac{x}{y}\ dx\,dy$

11. Find $\int_0^1 \int_0^1 x\sin(xy)\ \ dx\,dy$ and $\int_0^1 \int_0^1 x\sin(xy)\ \ dy\,dx$. Which way, if any, is easier?