Homework Set # 3

1. **(§2.2) Page 103:** # 8, 12(a)(b).

2. If $f(x, y) = (2x, 3\cos y, \ln x)$ and $g(x, y) = (x^2 + y^2, -2xy)$, then find $f \circ g$ and $g \circ f$, if possible. Compute $f(g(1, 0))$ and $g(f(1, 0))$, if possible.

3. **(§2.3) Page 115:** # 3(a)(c), 5, 10(a)(c), 11, 12, 16(a).

4. If $w = \dfrac{r^2 + s^2}{r^2 - s^2}$, show that $r\dfrac{\partial w}{\partial r} + s\dfrac{\partial w}{\partial s} = 0$, for all $r \neq s$.

5. Suppose $f : \mathbb{R}^2 \longrightarrow \mathbb{R}^3$ is the *linear* mapping $f(\mathbf{x}) = A\mathbf{x}$, where A is the 3×2 matrix $A = \begin{bmatrix} a_1 & a_2 \\ b_1 & b_2 \\ c_1 & c_2 \end{bmatrix}$.

   Compute the matrix of partials Df.

   <u>Note:</u> $f(x_1, x_2) = A\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$, and write RHS as a row.