| Fall 2020 | ENG 5300 | Quiz 2 | Jin Xue |

You must show **all** work to receive full credit. All work is to be your own.   October 5
This is a closed books and notes test. Be organized.   Total points: **20**   19:44- 19:57

1. Verify the following identities for f, $\mathbf{F}$ and $\nabla = \left[\frac{\partial}{\partial x}, \frac{\partial}{\partial y}, \frac{\partial}{\partial z}\right]$

   (a) Let $w = f(x, y, z)$ be a continuous function with continuous second partial derivatives. Verify that   5points

   $$\nabla \times \nabla f = \mathbf{0}$$

   (b) Let $F_1(x, y, z)$, $F_2(x, y, z)$, $F_3(x, y, z)$ be continuous functions with continuous second partial derivatives. Let $\mathbf{F} = [F_1, F_2, F_3]$. Verify that   5points

   $$\nabla \cdot \nabla \times \mathbf{F} = \mathbf{0}$$

2. §10.4 Evaluation of Line Integrals by Green's Theorem. Using Green's Theorem, evaluate $\oint_C \mathbf{F}(\mathbf{r}) \cdot d\mathbf{r}$ counterclockwise around the boundary curve C of the region R, where
   $\mathbf{F} = \operatorname{grad}\left(x^3 \cos^2(xy)\right)$, $R: 1 \le y \le 2 - x^2$ 10 points