Math 222 in class problems **Week: February 15, 2021**

1. Stewart
   Evaluate $\iint_D (x+2y)dA$, where D is the region bounded by $y=2x^2$ and $y=1+x^2$.
   Answer: 32/5

2. Evaluate the integral
$$\int\int_R \sin(y^2)dA$$
   where R is the region $x \leq y \leq 1,\ 0 \leq x \leq 1$.

3. John Hopkins Handout
   Attempt to evaluate both $\iint_R f(x,y)\ dydx$ and $\iint_R f(x,y)\ dxdy$ over $R = \{(x,y) \in [0,2] \times [0,1]\}$ with
$$f(x,y) = \begin{cases} f(x,y) = \dfrac{xy(x^2-y^2)}{(x^2+y^2)^3} & \text{for } (x,y) \neq (0,0) \\ f(0,0) = 0 \end{cases}$$
   Answers: $dydx$ yields 1/5 while $dxdy$ yields $-1/20$!?!

   Optional: demonstrate that the following limit DNE:
$$\lim_{(x,y)\to(0,0)} \frac{xy(x^2-y^2)}{(x^2+y^2)^3}$$

4. HW #3 problem 4 - Folland
   For each of the following regions $S \subset \mathbb{R}^2$, express the double integral $\int\int_S f\ dA$ in terms of iterated integrals in two different ways, e.g. find the limits of integration for $dA = dxdy$ and $dA = dydx$. YOU DO NOT NEED TO EVALUATE THE INTEGRALS!
   (a) $S =$ the region in the left half plane between the curve $y = x^3$ and the line $y = 4x$.
   (b) $S =$ the triangle with vertices $(0,0)$, $(2,2)$, and $(3,1)$.
   (c) $S =$ the region between the parabolas $y = x^2$ and $y = 6 - 4x - x^2$.