Quiz 3

You're getting a ton of extra time for this quiz, so please show **all** work, clearly specify your final answer and do so **neatly**. I will penalize you if your work is a mess! You have until 6:30 on 3/10/2020 to turn this in on BCourses.

Problem 1   (3 pts) Take the following partial integral

$$\int x\sqrt{x^2 + 3xy}\, dy$$

Problem 2   (3 pts) Take the following double integral.

$$\int \int e^{x/y^2} \, dx \, dy \qquad 1 \le y \le 2 \quad 0 \le x \le y^2$$

Problem 3   (2 pts) The population of rabbits in Australia in the late 19th century grew exponentially, doubled every year and started at 1000 rabbits in 1880. What was the average number of rabbits in Australia between 1890 and 1900?

Problem 4 (2 pts) The rabbits in New Zealand are growing even more quickly because every year, more rabbits immigrate with their rabbit families from England. The population there grows exponentially, naturally doubles every year, and (if t is number of years since 1880) we have $100t$ rabbits coming from overseas. In other words, the population $p(t)$ satisfies the ODE

$$p'(t) = \ln(2) \cdot p(t) + 100t$$

Solve this ODE to find the population $p(t)$ over time, assuming that the population at 1880 is 100.

Note If you use $p'(t) = 2p(t) + 100t$ instead, as in the old version, then that's fine and I will accept your solution.