QUIZ 18 SOLUTIONS: LESSONS 27-28
APRIL 4, 2018

Write legibly, clearly indicate the question you are answering, and put a box or circle around your final answer. If you do not clearly indicate the question numbers, I will take off points. Write as much work as you need to demonstrate to me that you understand the concepts involved. If you have any questions, raise your hand and I will come over to you.
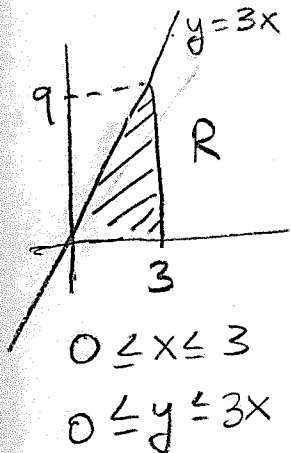
1. [5 pts] Compute

$$\int_0^1 \int_0^y (xy + 7)\, dx\, dy.$$

$$\int_0^1 \int_0^y (xy + 7)\, dx\, dy = \int_0^1 \left[\tfrac{1}{2}x^2 y + 7x \right]_{x=0}^{x=y} dy$$

$$= \int_0^1 \left[\tfrac{1}{2} y^3 + 7y \right] dy$$

$$= \tfrac{1}{8} y^4 + \tfrac{7}{2} y^2 \Big|_0^1$$

$$= \tfrac{1}{8} + \tfrac{7}{2}$$

$$= \tfrac{1}{8} + \tfrac{28}{8}$$

$$= \boxed{\tfrac{29}{8}}$$

2. [5 pts] Evaluate

$$\iint_R \frac{1}{x^2+1}\, dA$$

where R is the region bounded by $y = 3x$, $x = 3$, and the x-axis.

$y = 3x$

R

9

3

$0 \le x \le 3$

$0 \le y \le 3x$

$\int \frac{1}{x^2+1}\, dx$ is hard to integrate so I want to integrate with respect to y first.

$$\iint_R \frac{1}{x^2+1}\, dA = \int_0^3 \int_0^{3x} \frac{1}{x^2+1}\, dy\, dx$$

$$= \int_0^3 \frac{y}{x^2+1}\Big|_{y=0}^{y=3x}\, dx$$

u-sub $\longrightarrow$ $$= \int_0^3 \frac{3x}{x^2+1}\, dx$$

$u = x^2+1$

$du = 2x\, dx$

$u(2) = 3^2+1 = 10$

$u(0) = 0^2+1 = 1$

$$= \int_1^{10} \frac{3}{2}\, \frac{1}{u}\, du$$

$$= \frac{3}{2} \ln u \Big|_1^{10}$$

$$= \frac{3}{2} \ln 10 - \frac{3}{2} \underset{0}{\underbrace{\ln 1}}$$

$$= \boxed{\frac{3}{2} \ln 10}$$