## QUIZ 4 SOLUTIONS: LESSONS 3-4 SEPTEMBER 1, 2017

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.

Evaluate the following:

(1) [5 pts] 
$$\int_{e}^{e^2} \frac{3(\ln x)^2}{x} dx$$

**Solution**: This is a *u*-sub problem. Take  $u = \ln x$ , then  $du = \frac{1}{x} dx$  with

$$u(e) = \ln e = \ln e^1 = 1$$
 and  $u(e^2) = \ln e^2 = 2$ .

So,

$$\int_{e}^{e^{2}} \frac{3(\ln x)^{2}}{x} dx = \int_{1}^{2} 3u^{2} du$$
$$= u^{3} \Big|_{1}^{2}$$
$$= 2^{3} - 1^{3}$$
$$= 8 - 1 = \boxed{7}$$

(2) [5 pts] 
$$\int (x-1)e^x dx$$

<u>Solution</u>: This is an integration by parts problem. By LIATE, we take u = x - 1, so  $dv = e^x dx$ . Our table becomes

$$u = x - 1 \qquad dv = e^x \, dx$$
$$du = dx \qquad v = e^x$$

Hence,

$$\int (x-1)e^x \, dx = \underbrace{(x-1)}_u \underbrace{e^x}_v - \int \underbrace{e^x}_v \underbrace{dx}_{du}$$
$$= (x-1)e^x - e^x + C$$
$$= xe^x - e^x - e^x + C$$
$$= xe^x - 2e^x + C$$
$$= \underbrace{(x-2)e^x + C}$$