

**Quiz 8**  
**ECEn 370**  
(closed book)

Name: \_\_\_\_\_ KEY \_\_\_\_\_

1. Let  $X$  be distributed uniform, i.e.  $X \sim U(1,2)$ . Let  $Y = e^X$ . Use the general formula for transformations of one random variable shown below to find  $f_Y(y)$ .

$$f_X(x) = u(x-1)u(2-x)$$

$$\text{roots of } y = g(x): \quad y - e^x = 0 \quad \text{for } 1 \leq x \leq 2$$

$$y = e^x \rightarrow \text{a single root over this range.}$$

$$x_1 = \ln y$$

$$g'(x_1) = \left. \frac{d}{dx} e^x \right|_{x=x_1} = e^x \Big|_{x=\ln y} = y$$

$$f_Y(y) = \frac{u(\ln y - 1)u(2 - \ln y)}{|y|}$$

$$= \begin{cases} 1/y & e \leq y \leq e^2 \\ 0 & \text{otherwise} \end{cases}$$

$$\text{note: } \int_e^{e^2} \frac{1}{y} dy = \ln y \Big|_e^{e^2} = 2 - 1 = 1.$$