

## ECE 302 Midterm 2 Reference Formula

$$F_X(x|X \in A) = \frac{\int_{-\infty}^x f_X(x')1_A(x')dx'}{\Pr(X \in A)}$$

$$f_X(x|X \in A) = \frac{f_X(x)1_A(x)}{\Pr(X \in A)}$$

$$\Phi(x) = \int_{-\infty}^x \frac{1}{\sqrt{2\pi}} e^{-z^2/2} dz$$

$$\mathbb{E}[X^n] = \frac{1}{j^n} \frac{d^n}{d\omega^n} \varphi_X(\omega) \Big|_{\omega=0}$$

$$F_Z(z) = \iint_{(x,y):g(x,y) \leq z} f_{X,Y}(x,y) dx dy$$

$$F_{U,V}(u,v) = \iint_{(x,y):g(x,y) \leq u, h(x,y) \leq v} f_{X,Y}(x,y) dx dy$$

$$f_{U,V}(u,v) = f_{X,Y}(x(u,v), y(u,v)) \left| \frac{\partial(u,v)}{\partial(x,y)} \right|^{-1}$$

$$\frac{\partial(u,v)}{\partial(x,y)} = \left| \begin{bmatrix} \frac{\partial u}{\partial x} & \frac{\partial u}{\partial y} \\ \frac{\partial v}{\partial x} & \frac{\partial v}{\partial y} \end{bmatrix} \right|$$

$$\frac{d}{dy} \int_{a(y)}^{b(y)} f(x) dx = f(b(y)) \frac{db(y)}{dy} - f(a(y)) \frac{da(y)}{dy}$$

**Note on pdfs and pmfs:** You will need to memorize the pdf (pmf) of a continuous (discrete) uniform random variable. You must also know

how to identify the mean and variance terms in a Gaussian pdf. Any other distribution discussed in the notes will be given to you. You do not need to memorize the means or variances of any of the distributions discussed in class.