CS70 - Final Cheat Sheet

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Continuous RVs

Memoryless Expo
Let X =Expo(λ). Then, for $s, t > 0$

$$\Pr[X > t + s | X > s] = \Pr[X > t] \tag{1}$$

Scaling Expo
Let X =Expo(λ) and $Y = aX$ for some $a > 0$

$$\Pr[Y > t] = \text{Expo}(\lambda / a) \tag{2}$$

$$a \times \text{Expo}(\lambda) = \text{Expo}(\lambda / a) \tag{3}$$

Scaling Uniform
Let $X = U[0, 1]$ and $Y = a + bX$ where $b > 0$

$$\Pr[Y \in (y, y + \delta)] = \frac{1}{b}\delta, \text{ for } a < y < a + b \tag{4}$$

$$f_Y(y) = \frac{1}{b} \text{ for } a < y < a + b \implies Y = U[a, a + b] \tag{5}$$

Scaling PDF
Let $f_X(x)$ be the pdf of X and $Y = a + bX$ where $b > 0$

$$\Pr[Y \in (y, y + \delta)] = f_X(\frac{y - a}{b})\frac{\delta}{b} \tag{6}$$

$$f_Y(y) = \frac{1}{b} f_X(\frac{y - a}{b}) \tag{7}$$