University of Mannheim
School of Social Sciences
Math Refresher for Political Science, Fall 2025
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Problem Set: Probability Theory II

1. Consider the p.d.f. $f(x) = 2x$ for $0 \leq x \leq 1$.
   (a) Calculate the c.d.f. of $f(x)$.
   (b) Is $f(x)$ a proper p.d.f.?
2. Consider the c.d.f. $G(x) = \frac{1}{9}x^2$ for $0 \leq x \leq 3$.
   (a) Calculate the p.d.f. of $G(x)$, $g(x)$.
   (b) Is $g(x)$ a proper p.d.f.?
3. Consider the p.d.f. $h(x) = \frac{4}{3}(1 - x^3)$ for $0 < x < 1$. Determine
   (a) $\Pr(X < \frac{1}{2})$.
   (b) $\Pr(X > \frac{1}{3})$.
   (c) $\Pr(\frac{1}{4} < X < \frac{3}{4})$.
4. Consider the p.d.f. $k(x) = cx^2$ for $1 \leq x \leq 2$. Determine
   (a) Find the value of the constant c.
   (b) Find $\Pr(X > \frac{3}{2})$.