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ECONOMICS 7330 – Probability and Statistics, Fall 2026

Homework 4. Due Monday September 21.

1. Assume that X and Y follows a bivariate normal distribution.

Demonstrate that $X + Y$ is normally distributed—a super important result. (Hint: use the convolution formula and “complete the square.” You can use that $(z - s)^2 + s^2 = 2 * (s - \frac{z}{2})^2 + \frac{z^2}{2}$.)

2. Assume that X and Y are exponentially distributed, independently and with mean θ . Find the distribution of $X + Y$.

3. Assume that X is an n -dimensional random variable with covariance matrix Σ and Y is an n -dimensional random variable, independent of X with covariance matrix Ω . Show that the covariance matrix for $X + Y$ is $\Sigma + \Omega$.