Stat 134: Section 24

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Conceptual Review

Please discuss these short questions with those around you in section. These problems are intended to highlight concepts from lecture that will be relevant for today's problems.

a. Suppose X, Y are standard normal variables with correlation $\rho = 0.3$, and (X, Y) a point in the plane. True or False: (X, Y) have the same joint distribution as (X_θ, Y_θ), which is the rotation of (X, Y) clockwise by $-\theta$.

b. Suppose (X, Y) follows a standard bivariate normal distribution with correlation ρ. What is the conditional distribution of Y given X?

Problem 1

Here is a summary of Pre-SAT and SAT scores of a large group of students.

PSAT scores:	average: 1200	SD: 100
SAT scores:	average: 1300	SD: 90
	correlation: 0.6	

Assume the data are approximately bivariate normal in distribution.

a. Of the students who scored 1000 on the PSAT, about what percentage scored above average on the SAT?

b. Of the students who scored below average on the PSAT, about what percentage scored above average on the SAT?

c. About what percentage of students got at least 50 points more on the SAT than on the PSAT?

Ex 6.5.1 in Pitman's Probability

Problem 2

Let X and Y be independent standard normal variables.

a. For a constant k, find $P(X > kY)$;

b. If $U = \sqrt{3}X + Y$, and $V = X - \sqrt{3}Y$, find $P(U > kV)$;

c. Find $P(U^2 + V^2 < 1)$;

d. Find the conditional distribution of X given $V = v$.

Ex 6.5.6 in Pitman's Probability