Please write your name at the top of this page, and nowhere else.

In addition to this cover page, there should be four pages of problems.

No notes, books, calculators, computers, etc. are allowed.

Feel free to ask clarifying questions. If a problem is unclear and you cannot obtain clarification, then write your interpretation of the problem, so that I can evaluate your solution relative to your interpretation. You might be penalized, if your interpretation makes the problem much easier than it should be. Certainly you should never interpret a problem in a way that renders it trivial.

Unless a problem says otherwise, you may cite material (definitions, theorems, etc.) that we have developed in class, in the assigned textbook readings, or in the assigned homework. You do not need to re-define or re-prove any of that material. You may not cite other material without developing it first.

If you introduce any notation, then define it before you use it. (For example, "Let A be the event that ...") Show your work, in as organized a manner as possible.

Incorrect answers with work shown often earn partial credit. Correct answers without work shown rarely earn full credit. Do simple arithmetic but not complicated arithmetic. For example, simplify $35/14$ down to $5/2$, but do not simplify $0.14921 \cdot 0.23323$ down to 0.03480025.

Write as if your audience is a typical classmate — not a professor. In doing so, you (hopefully) show enough detail, that I can evaluate whether you yourself understand your arguments.

Pictures often help both you and your reader.

You have 60 minutes. Good luck. :)

A. Let X be a standard normal random variable. Of the following three tasks, do whichever is easiest: Show that f_X integrates to 1, compute $E(X)$, or compute $V(X)$. (You may not simply cite the answer. You must show the entire computation including integration.)

B. Let $X, Y \sim \text{Norm}(0, 1)$ be independent. Is $X + Y$ independent of Y?

It is common to model floods on a river as a Poisson process. On the Boise River at Twin Springs, Idaho, a "100-year flood" is defined to be a flood with flow rate 470 m^3/s (or more). This means that a flood of that severity (or more) occurs, on average, once every 100 years.

C.A. What is the probability that one or more 100-year floods will happen in the next 30 years? Be as explicit and thorough as you can, without a calculator.

C.B. Within this flood context, ask a question, whose answer is a Poisson-distributed random variable. Be explicit about the value of λ and the time unit.

D. Let X have PDF $f_X(x) = x^{-2}$ on support $[1, \infty)$. Let Y be independent of X with the same distribution. Let $Z = X + Y$. What are the support and the PDF of Z? (Do the computation as far as you can, but stop if you need calculus techniques that we have never used in this course.)

Suppose that X and Y are jointly distributed, are supported on the triangle with vertices $(0,0)$, $(2,1)$, $(0,1)$, and have PDF $f_{X,Y}(x,y) = 2xy$ on that support.

E.A. Are X and Y independent?

E.B. What's the marginal distribution of X (with support, PDF, and correct notation)?

E.C. What's the conditional distribution of Y given X (support, PDF, correct notation)?