Blackboard exam 2, Mathematics Mathematics 3501, Section ETY6
Starts: 6:55 pm, Thurs, Mar 18; ends: 7:45 pm (late submission loses points).
Instructor: Attila Máté

Follow these instructions carefully:

Show all your work. Your explanations count for much more that simple correct answers. Your wording must be your own; using my words will not earn any credit; your explanations must indicate that you understand the material, not simply copy the explanations from somewhere else.

Do not change the notation in the question. Changing the notation can result in a serious loss of points. In important cases, you may get zero points for changing the notation. This is especially true for proofs that you may find online or in a textbook with a different notation. Changing the notation to a notation you may find in a publicly available source may be taken as evidence of illegitimate copying, and you may be penalized appropriately.

You must work on your own; collaboration will inevitably show up with similar wordings of the explanations and invalidate your answer. Clear signs of cheating will be taken seriously.

Blackboard allows, but will indicate, late submissions. In case of multiple submissions, only the last one will count.

1. *a*) In a factory, parts are manufactured by three machines, M_1, M_2, and M_3 in proportions $10 : 30 : 60$. The percentages 4%, 7%, and 3% of these parts are defective, respectively. Find the probability that a randomly chosen part is defective.

b) Find the probability that a defective part was manufactured on the third machine.

2. Let X be the random variable with density function

$$f_X(x) = \begin{cases} 4x^{-5} & \text{if } x \ge 1, \\ 0 & \text{otherwise.} \end{cases}$$

a) Find the expectation of X.
b) Find the variance of X.
c) Find the expectation of X^3.

3. *a*) Let A, B, and C be events, and let I_A, I_B, and I_C be their indicator variables. Describe the event whose probability equals the expectation

$$\mathrm{E}\big(1 - (1 - I_A)(1 - I_B)(1 - I_C)\big)$$

b) Given events, use indicator variables to derive the formula for the event described in the answer to Part *a*).