

A3 exam, 2020. jan. 28.

1	2	3	4	5	6	7	8	9	Σ	1. zh	2. zh	ΣΣ	jegy

Name:

Neptun-code:

1. (10p) Solve the following differential equation: $y' = \frac{y}{x} + \frac{y^2}{x^2}$.
2. (10p) Solve the following differential equation: $y' = \frac{x^3 - 2y}{x}$.
3. (10p) Solve the following initial value problem:

$$2y^2y'' = (y')^3, y(0) = 1, y'(0) = 2.$$

4. (10p) If we throw a die six times what is the probability that we will have at least one six?
5. (10p) Provided that we obtain exactly two heads after flipping a fair coin three times, what is the probability that the first flip was head?
6. (10p) The lifetime of an automobile battery follows exponential distribution with mean 3 years.
 - (a) Calculate the probability that the lifetime will be between 2 and 4 years.
 - (b) If the battery has lasted for 3 years, what is the probability that it will last for at least 2 additional years?

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7. (10p) Suppose that the annual rainfall in Hungary is normally distributed with mean 600 mm and standard deviation 75 mm. Suppose that the annual rainfalls are independent.
 - (a) What is the probability that the rainfall will be over 750 mm next year?
 - (b) On average, how many years do we have to wait for such a year?
8. (10p) Solve the following differential equation system:

$$2x' - 4x + y' - y = e^t, \quad x' + 3x + y = 0.$$

9. (10p) The number of requests a website receives in each second follows Poisson distribution with mean 1.3. The website crashes if it gets 120 or more requests in a single minute. Using the central limit theorem, estimate the probability that the server crashes in the next minute.