Question 1

Please provide a short description of the following statistical tests. Make sure to include any key assumptions and what the tests are used for.

1. ANOVA
2. T-test
3. Wilcoxon rank sum test.

Question 2

Import this Google sheet in R/Python and for each of the parameters (P1 to P10) perform a t-test and ANOVA. Share the link of your results and the script.

Question 3

In a study, physicians were asked what the odds of breast cancer would be in a woman who was initially thought to have a 1% risk of cancer but who ended up with a positive mammogram result (a mammogram accurately classifies about 70% of cancerous tumors and 80% of benign tumors.) What is the probability of cancer in the woman?

Question 4

Assume A and B are matrices with entries that are from the standard normal distribution. Will entries in the product of the matrices (AB) be normally distributed? If we needed to control the variance in the product, how would we do that?

Question 5

Explain Bessel's correction in the context of calculating the sample variance as compared to the population variance.

Question 6

Describe an appropriate distribution to model stock returns.

Question 7

Write a brief report containing the analysis and visualization of the following example data generated from a hypothetical pseudovirus neutralization assay. Analysis and visualization should be consistent with those shown in literature. State your assumptions and any formulae used in your calulcations.

The following table represents a simplified example of raw data from a pseudovirus neutralization assay, measuring luminescence (indicative of virus entry) in response to increasing concentrations of a neutralizing antibody. Each measurement is the average luminescence from duplicate wells.

Antibody Concentration (µg/mL)	**Luminescence (Relative Light Units, RLU)**
0 (Virus control)	120,000
0 (Cell control)	500
0.01	115,000
0.1	95,000
1	60,000
10	25,000
100	5,000

- **Virus control (V):** Wells containing virus and cells but no antibody. This serves as the maximum infection control.

- **Cell control (C):** Wells containing cells only, without virus or antibody, to measure background luminescence.
- **Antibody dilutions:** Different concentrations of the antibody being tested are distributed across the plate to assess their neutralizing activity.