

Quiz 0

No marks. This quiz is only to help us understand your background and help you understand desirable background knowledge. The TAs will help you pick up these basics if you need BUT you will need to work as well.

1. Suppose that you have two different types of pumps with different probabilities p 's of failure on any particular day. Let these probabilities be p_1 and p_2 . What is the probability that the first failure is on the i -th day? Assume that the chance of failure does not depend on the number of days that a pump is in use.
2. Classify the following matrices as positive definite, positive semidefinite, indefinite¹, *etc.*, while providing justification and outlining all the steps:

(a)

$$A = \begin{bmatrix} 5 & 3 & 1 \\ 3 & 4 & 2 \\ 1 & 2 & 6 \end{bmatrix}$$

(b)

$$A = \begin{bmatrix} 1 & 0 & 4 \\ 0 & 2 & 0 \\ 4 & 0 & 18 \end{bmatrix}$$

3. Look at the figure below which plots the female literacy (X axis) and the average number of children that a woman has (Y axis), for about 100 habitations. Make english language comments about this graph and illustrate what mathematical procedures you would do to validate/justify your comments. Just from the data, is X likely to determine Y or the other way around? Why?

¹Note that a matrix A is indefinite if neither A nor $-A$ is positive semi-definite.

