Unless specifically mentioned, please do all the work in R.

Let .

**Problem 1.**

Find the following:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
| 1. Are and orthogonal? | | | 1. Are and orthogonal? | | |
| 1. Calculate . Now divide by 3. | | | 1. What is the mean of the elements of ? | | |
| 1. Calculate (by hand, not in R) | | | 1. What does represent? | | |

**Problem 2.**

Create the matrix and let . Find the following:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
| 1. Are and orthogonal? | | | 1. Is full rank? | | |
| 1. Find | | | 1. Is ? | | |
| 1. Find | | | 1. Is ? | | |
| 1. Can we do ? Why, or why not? | | |  | | |