# 1 PCA

## 1

## 2

By hand:

By code:



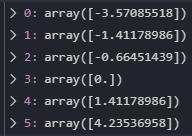
## 3

They are the same.

## 4

By hand:

By code:



# 2 EM

## 2.1

No. it can not be solved directly. Because we do not know which coins were flipped after we flipped A. There are some latent data in this problem.

Also, the Eq is difficult to maximize.

## 2.2

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| j | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|  | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

## 2.3

|  |  |
| --- | --- |
|  | 0.5 |
|  | 0.6 |
|  | 0.6 |

## 2.4

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| j | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|  | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

## 2.5

|  |  |
| --- | --- |
|  | 0.5 |
|  | 0.6 |
|  | 0.6 |

## 2.6

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| j | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|  | 0.3636 | 0.3636 | 0.4706 | 0.3636 | 0.4706 | 0.4706 | 0.3636 | 0.4706 | 0.3636 | 0.3636 |

|  |  |
| --- | --- |
|  | 0.4064 |
|  | 0.5368 |
|  | 0.6433 |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| j | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|  | 0.3636 | 0.3636 | 0.4706 | 0.3636 | 0.4706 | 0.4706 | 0.3636 | 0.4706 | 0.3636 | 0.3636 |

|  |  |
| --- | --- |
|  | 0.4064 |
|  | 0.5368 |
|  | 0.6433 |

is not the same as that in Question 2.5.

### 2.7

The results are not the same with different initialization.

