a) $X = \begin{bmatrix} x_t \\ u_t \end{bmatrix}$, $\vec{w} = [A, B]$, $\vec{y} = \vec{w} \cdot X$

$$\min L(A,B) = \sum_{t=1}^{T-1} (x_{t+1} - A x_t - B u_t)^2$$

b)

```python
1 mdict = scipy.io.loadmat("{}a.mat".format(path_prefix))
2 x = mdict['x'][0]
3 u = mdict['u'][0]
4
5 # Required: write code below that produces two variables, A and B, which
6 # are scalars of type numpy.float64 that represent the model parameters
7 # A and B
8
9 ### start 1 ###
10 X = np.matrix([x[:-1], u[:-1]]).T
11 A, B = np.linalg.lstsq(X, x[1:], rcond=None)[0]
12 ### end 1 ###
13
14 # Do not modify the lines below
15 assert(isinstance(A, np.float64))
16 assert(isinstance(B, np.float64))
17
18 print("A: {}, B: {}".format(A, B))
```

```
A: 0.9775521351844118, B: -0.08775321877345647
```

https://numpy.org/doc/stable/reference/generated/numpy.linalg.lstsq.html