Name: _____ USC ID: _____

Quiz 7: Recommendation Systems (10 points), **15 minutes**

TA handling this quiz: Abhishek Bhatt abhishpb@usc.edu

Consider the following utility matrix M which records ratings from users: A, B, and C on movies: M1, M2, M3, and M4. **For all computations below, show how you derive the final result.**

	M1	M2	M3	M4
A	4		2	3
B		5		3
C	2		3	

1. [4 points] Consider finding UV-decomposition of M with a **single** latent factor. Suppose in the initial guess, the values of elements in U and V are all 1's. What is the **squared error** of the guess?
   U*V =

1	1	1	1
1	1	1	1
1	1	1	1

   squared error = (4-1)^2 + (2-1)^2 + (3-1)^2 + (5-1)^2 + (3-1)^2 + (2-1)^2 + (3-1)^2 = 39

2. [4 points] Find a new value for **V**[1,1] (while holding all others constant) to minimize the error.

y	1	1	1
y	1	1	1
y	1	1	1

   minimize (4-y)^2 + (2-y)^2
   Differentiate wrt y Equate to 0
   y = 3

3. [2 points] How much is the **reduction** in the **squared error** with the new value of **V**[1,1]?

   Old SE for 1st column - New SE for 1st column
   10 - (4-3)^2 - (2-3)^2 = 8