# CV202, HW2

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## Problem 18

The answer is no. There is no continuous curve , from the unit interval to the affine group, such that and .

We will show that by observing any possible continuous curve , , such that:

We know that:

is a continuous curve, so for any :

And is continuous!

Now, as we know from the Leibniz formula, a determinant of a matrix is a polynomial expression of the matrix entries. Every entry in our is continuous over , therefore we can say is a continuous curve as well!

Now we know it begins in , and ends at , therefore exists such that !

So we can see that we do not have the case , showing no continuous curve exists between the two affine maps.

## Problem 19

### Part (i):

We need to find the least square estimator for .

We want to find such that for all : .

So our problem is described by:

Now let’s observe :

Now let:

**,**

And we get:

Now:

And as we’ve learned, the minimizer satisfies:

### Part (ii):

For this part we will note that we are looking for (let be our probability density function):

We know the probability density function of , so:

Where:

### Part (iii):

The maximum likelihood estimator for will be achieved by getting the maximum of the **log likelihood function** (as it is a monotonic non-decreasing function):

To get the maximum , we will look for a gradient of .

We will start with :

And now for :

## Problem 20

We need to find:

Let’s observe:

And this is of LS form, so we know our solution is:

## Problem 21

So we need to find:

But means:

for some

So we can rewrite our problem:

As when we find the right , we can get our .

Now, as we know is a monotonic non-decreasing function, so we can rewrite again:

And now we can it’s a LS problem. For :

So now we can use our known solution:

## Problem 25

## Problem 26

## Problem 29

## Problem 30