**Sareh Kouchaki – Section 2**

**Statistical-Modeling-II**

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Exercise 2.1: Derive the conditional posterior distributions .

The likelihood can be written in this form:

Conjugate prior:

Posterior:

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So,

Normal Gamma distribution,

Exercise 2.2: Derive the conditional posterior distribution and .

First, we need to find which is equal to

Next, we need to find which is equal to:

So,

Exercise 2.3: Show that the marginal distribution over is a centered, scaled t-distribution.

Marginal distribution over

Under the integral is the kernel of gamma ( distribution

where .

So,

t distribution:

Exercise 2.4:

Under the integral is the kernel of gamma ( distribution

where .

So,

t distribution:

Exercise 2.5:

Exercise 2.6:

Exercise 2.7: Show that in the univariate case, the inverse Wishart distribution reduces to the inverse gamma distribution.

Solution:

Probability density function of the inverse Wishart is as follows:

Where and are d\*d positive definite matrices, and is the multivariate gamma function.

With d=1, the probability density function of inverse Wishart becomes:

= Inverse Gamma (

Exercise 2.8:

Posterior distribution can be written as following:

From the question we have:

So,

Continue

Exercise 2.9:

From the question we have:

We want to find

So, we can write

First, we need to find calculate :