> **Instructions:**
> Read the questions carefully and plan accordingly before answering. Use the backside of the pages if extra space is required.

Name: _____

Signature: _____

1. (30 marks) In a study on effect of certain nutrients on the birth weight of guinea pigs record the following data:

   Table 1: Birth weight (gms)

   | 421 | 453 | 456 | 495 | 374 |
   |-----|-----|-----|-----|-----|
   | 91  | 111 | 96  | 82  | 102 |

   (a) Test the hypothesis that mean body weight is 300 grams. Use $\alpha = 0.05$

   (b) Why do we say "failed to reject the null hypothesis" instead of "accept the null hypothesis"?

   (c) Explain how you could answer the question in part (a) with a two sided confidence interval on mean body weight.

2. (30 marks) The following ANOVA table has been prepared for the experiment where 3 different levels of a factor has been varied. Fill in the blanks and check whether everything given is consistent or not. Some round-off error is expected.

| Source | DF | $SS$ | MS | F | P |
|--------|-----|-------|-------|-----|-------|
| Factor | __ | __ | 192.3 | __ | 0.005 |
| Error | 12 | __ | 22.9 | | |
| Total | __ | 658.9 | | | |

3. (40 marks) Use the properties of $\chi^2$ distribution to show that the sample variance is an unbiased estimator of the population variance.