

Stat312: Midterm Exam II.

Moo K. Chung, Tao Yu
mchung@stat.wisc.edu, yutao@stat.wisc.edu

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Answer all questions clearly and **circle your final answer**.
Your answers should be correct up to the **second decimal places**.
One page note and a calculator are allowed.
No textbooks, scrap papers or hand-held computers, PDA are allowed.
This exam booklet consists of **3 problems** and **6 pages**.

Name: _____
Student ID: _____

Pledge: On my honor, I have neither given nor received unauthorized
aids on this examination.

Signature: _____

Question	Points
1	
2	
3	
Total	

1. The amount of lateral expansion was determined for a sample of 15 pulsed-power gas metal arc weld used in LNG ship containment tanks. The measurements and necessary R output are given below. Assuming normality, derive a 99% confidence interval for population standard deviation σ [5pts].

```
> Y<-c(25,25,17,28,24,26,26,26,23,30,25,24,29,23,20)
> mean(Y)
[1] 24.73333
> var(Y)
[1] 10.78095
> qchisq(c(0.005, 0.01, 0.995, 0.99), 15)
[1] 4.60  5.23 32.80 30.58
> qchisq(c(0.005,0.01, 0.995, 0.99), 14)
[1] 4.07  4.66 31.32 29.14
```

2. Consider a sample of fat content of 100 randomly selected hotdogs. We have following observations: $\bar{x} = 22, S^2 = 10^2$. We are interested in checking if the fat content is 24.

```
> qnorm((1:10)/200)
[1] -2.57 -2.33 -2.17 -2.05 -1.96 -1.88 -1.81 -1.75 -1.6 -1.64

> qt((1:10)/200,99)
[1] -2.63 -2.36 -2.20 -2.08 -1.98 -1.90 -1.83 -1.77 -1.71 -1.66
```

- (1) What is a test statistic and its distribution under the null assumption? [5pts].
- (2) What is the rejection region at level 0.01? Perform the test if the fat content is 24 at level 0.01 [5pts].

- (3) What is the type II error of the previous test when the actual fat content of hotdogs is 23?
Express your answer using function Φ , which is defined as $\Phi(y) = \int_{-\infty}^y \frac{1}{\sqrt{2\pi}} e^{-y^2/2} dy$ [5pts].

3. When you toss a coin 100 times, you observed 40 heads.

(1) Construct a 99% confidence interval for the probability of getting head [5pts].

(2) Test if the coin is biased at level 0.01 [5pts].