Quiz 4 **November 1, 2004- Due November 5**

Name:
ID:

Problem 1: Exercise 4.94 page 296
Problem 2: Exercise 4.96 page 297
Problem 3: Exercise 4.101 page 298
Problem 4: Exercise 4.110 page 302

Problem 1: (2 points)

Population: Axles for auto parts
measurement on that population X= diameter of the axle
Data: $\mu = 40.125mm, \quad \sigma = 0.002mm, \; n = 4$
The sampling distribution of the sample mean states that the mean $\mu(\bar{X}) = \mu$ and $\sigma_{\bar{X}} = \frac{\sigma}{\sqrt{n}}$

$$\mu(\bar{X}) = 40.125 \text{ and } \sigma_{\bar{X}} = \frac{0.002}{2} = 0.001$$

Problem 2: Glucose Testing (one point each, total 3 points)

$X =$ Glucose measurement for Sheila
Sheila is having gestational diabetes if $X > 140 \; mg/dl$
Data: X has a normal distribution with mean $\mu = 125mg/dl$ and $\sigma = 10mg/dl$

(a) If measurement are taken once a day, we have a single Glucose measurement, $n = 1,$ then

$$\begin{aligned} P(X > 140) &= P(z > \frac{140 - \mu}{\sigma/\sqrt{n}}) \\ &= P(Z > \frac{140 - 125}{10/\sqrt{1}}) \\ P(Z > 1.5) &= 1 - 0.9332 \\ &= 0.0668 \end{aligned}$$

(b) if meausurement are taken 4 days, $n = 4,$ then

$$\begin{aligned} P(X > 140) &= P(z > \frac{140 - \mu}{\sigma/\sqrt{n}}) \\ &= P(Z > \frac{140 - 125}{10/\sqrt{4}}) \\ P(Z > 3) &= 1 - 0.9987 \\ &= 0.0013 \end{aligned}$$

(c) we will prefer method (b)

Problem 3: (3 points)

Using the same problem as before
Population: Glucose measurement:X has a normal distribution with mean $\mu = 125mg/dl$ and $\sigma = 10mg/dl$
Find L such that

$$P(sample\ mean > L) = 0.05$$

$$P(\bar{X} > L) = 0.05$$

$$P(\frac{\bar{X} - \mu}{\sigma/\sqrt{n}} > \frac{L - \mu}{\sigma/\sqrt{n}}) = 0.05$$

$$P(Z > \frac{L - 125}{10/\sqrt{4}}) = 0.05$$

This means that the critical value for 0.05 $z = 1.65$
So $\frac{L-125}{10/\sqrt{4}} = z,$ means that $L = (z \times 5) + 125 = 1.65 \times 5 + 125 = 133.25$

Problem 4: one point for each, total 2 points

Population: cars passing in the highway
Measurement: X is the number of person per car during the rush hour.
Population of all cars has a mean of people per car $\mu = 1.5$ and $\sigma = 0.75$

(a) The distribution of X is not normal because X is the counts so they are integer and do not take negative number
(b) If we are using$n = 700$ cars per hour, the average of person per car $\bar{X}$ has a normal distribution with $\mu_{\bar{X}} = 1.5$ and $\sigma_{\bar{X}} = \frac{0.75}{\sqrt{700}} = 0.0283.$
We have to calculate

$$P(\bar{X} > \frac{1075}{700} = 1.535)$$

$$= P(Z > \frac{1.53 - 1.5}{0.028})$$

$$P(Z > 1.0714) = 1 - 0.8577$$

$$= 0.14$$