Pharm 3011 - Fall 2019 - Assignment 3
Due Thursday, Nov 7, at beginning of class.

1. A logistic regression of "toxemia" (1=yes, 0=no) on mother's age was carried out. Where p_x denotes the probability of toxemia given a mother of age x, the model fit was

$$log\left(\frac{p_x}{1-p_x}\right) = \alpha + \beta x$$

leading to the following partial computer output.

```
Logistic Regression Table

Predictor      Coef   SE Coef   Z
Intercept     -16.0     4.0
mother's age    0.8     0.4
```

   (a) What is the estimated log odds of toxemia for a mother of age 25 years?

   (b) What is the estimated log odds of toxemia for a mother of age 30 years?

   (c) What is the odds ratio for a 30 year old mother, as compared to a 25 year old mother?

   (d) To test the hypothesis $H_0 : \beta = 0$ against the alternative $H_0 : \beta \neq 0$, what is the observed value of the test statistic?

   (e) Construct a 90% confidence interval for β.

   (f) Construct a 90% confidence interval for the log odds ratio,

$$log\left(\frac{p_{26}}{1-p_{26}}\frac{1-p_{25}}{p_{25}}\right)$$

   .

   (g) Transform the CI from part f to get a 90% confidence interval for the odds ratio

$$\frac{p_{26}}{1-p_{26}}\frac{1-p_{25}}{p_{25}}$$

   .

   (h) Based on the CI calculated in part g, would you reject the null hypothesis in part d when testing at level .10? Why?

2. A second study estimated the log odds of toxemia for a 25 year old mother as -3. For this second study, what is the estimated probability of toxemia for that mother.

3. A study was carried out to compare two population means, μ_1 and μ_2. A 95% confidence interval for $\mu_1 - \mu_2$ was calculated as (-8.5, 12.9), and a 90% confidence interval was calculated as (-6.9, 10.7).

   (a) When carrying out an equivalence test of $H_0 : |\mu_1 - \mu_2| \geq 15$ vs $H_A : |\mu_1 - \mu_2| < 15$ at level .05, would you reject the null hypothesis of non-equivalence? Why?

   (b) Assuming that a large value of the mean is a favourable outcome, when carrying out a non-inferiority test of $H_0 : \mu_1 \leq \mu_2 - 15$, vs $H_A : \mu_1 > \mu_2 - 15$ at level .05, would you conclude that treatment 1 (which gave mean μ_1) is noninferior to treatment 2 (which gave mean μ_2). Why?

   (c) Assuming that a large value of the mean is a favourable outcome, when carrying out a superiority test of $H_0 : \mu_1 \leq \mu_2 + 15$, vs $H_A : \mu_1 > \mu_2 + 15$ at level .05, would you conclude that treatment 1 (which gave mean μ_1) is superior to treatment 2 (which gave mean μ_2). Why?