1. I want to print something in the computer lab in Snedecor early in the morning. It takes a while for the printer to warm up but I can hear when it finally actually starts to print. Assume that if the printer is working that the amount of time before it starts printing (the warm up time) follows an exponential distribution with $\alpha = .5$. If the printer is broken or jammed then it just won't print ever. I want to conduct a test of H_0 : Printer is working against H_a : Printer is broken or jammed.

   (a) How long should I wait before rejecting the null if I want my type I error rate to be 0.05.

   (b) What is the type II error rate in this situation?

2. Use the following data to answer the given questions:

   ```
   1  1  1  1  2  2  2  2  2  3  5  7  8 10 11
   ```

   (a) Make a 95% confidence interval for the population mean for this data

   (b) Use your confidence interval to conduct a test $H_0 : \mu = 5$ against $H_a : \mu \neq 5$

   (c) A t-test and confidence intervals based on the t-distribution assume that the data itself is normally distributed. For a large sample size this assumption doesn't matter so much but for small sample sizes we should check this assumption. Do you believe the normal distribution assumption is met in this case? Explain.

3. T. Johnson tested properties of several brands of 10 lb test monofilament fishing line. Part of his study involved measuring a stretch of a fixed length of line under a 3.5 kg load. Test results for three pieces of two of the brands follow. The units are cm.

Brand B	Brand D
.96, .98, .98	1.02, 1.04, 1.06

   (a) Carry out a formal significance test of the hypothesis that the two brands have the same mean stretch values (use a two-sided alternative hypothesis) - use the rejection region method and use $\alpha = .05$

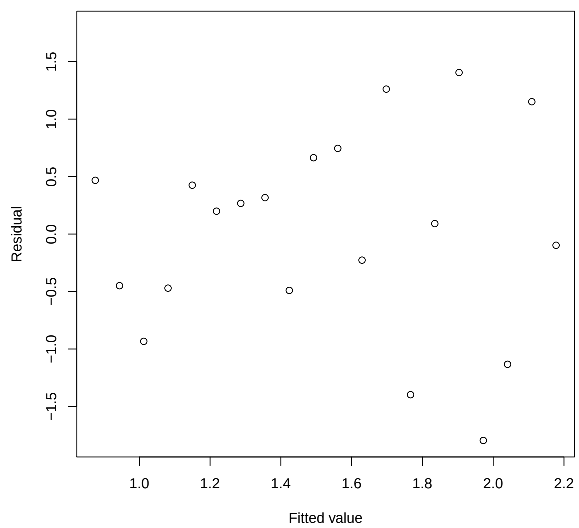
   (b) Create a 95% confidence interval for the difference of the means of the stretch values.

   (c) Do your confidence interval and the hypothesis test give you the same conclusion?

4. Say we have the following information about two variables X and Y and we want to predict Y using X.

Quantity	value
n	20
$\sum x$	10.00
$\sum y$	30.53
$\sum(x-\bar{x})^2$	1.84
$\sum(y-\bar{y})^2$	17.69
$\sum(x-\bar{x})(y-\bar{y})$	2.40
s_{LF}	0.8995

Statistic	N	Mean	St. Dev.	Min	Max
x	20	0.500	0.311	0.000	1.000



(a) What is the fitted least squares line for this data?

(b) Make predictions for y at $x = .2$ and for $x = 1.3$.

(c) Which prediction do you trust more? Why?

(d) Are there any noticeable problems that are implied by the residual plot?

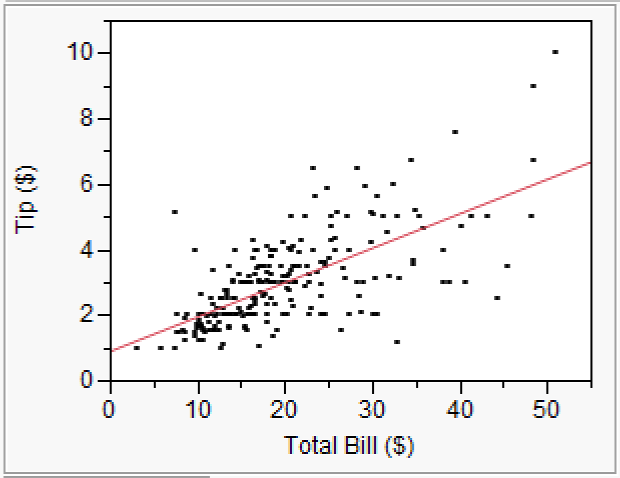
(e) Conduct a formal hypothesis test to test $H_0 : \beta_1 = 1$ against $H_a : \beta_1 \neq 1$.

5. What are the four assumptions we make when doing inference for simple linear regression? How would you diagnose if the assumption is met or broken (which plots or methods would you use to test the assumption)?

6. Make an example plot where each of the following 3 assumptions (correct model, constant variance, normality of error term) are met and an example plot where the assumptions are not met.

7. The following is JMP output from regressing tips using total bill

Bivariate Fit of Tip ($) By Total Bill ($)



Linear Fit

Linear Fit

Tip ($) = 0.9202696 + 0.1050245*Total Bill ($)

Summary of Fit

RSquare	0.456617
RSquare Adj	0.454371
Root Mean Square Error	1.022048
Mean of Response	2.998279
Observations (or Sum Wgts)	244

Lack Of Fit

Analysis of Variance

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	0.9202696		5.76	<.0001*
Total Bill ($)	0.1050245	0.007365		

(a) What is the t-ratio and approximate p-value for the test of $H_0 : \beta_1 = 0$ against $H_a : \beta_1 \neq 0$

(b) Perform a test of $H_0 : \beta_1 = 0.10$ against $H_a : \beta_1 \neq 0.10$.

(c) If you create a 95% confidence for the intercept parameter - will 0 be included in the interval?

(d) Create a 95% confidence interval for the average tip left when total bill is 0.

(e) Do you trust the previous confidence interval? Why or why not.

(f) Given that $\sum(x - \bar{x})^2 = 19258.46$ create a confidence interval for the average tip when total bill is 25 dollars.