Stat 3011 Final Exam (In-Class Part) **Dec. 21, 2000**

The exam is closed book. You may use a calculator, and one $8\frac{1}{2}$ by 11 sheet of paper with formulas (or anything else) on it, but no other notes. Put all of your work on this test form (use the back if necessary). Show your work or give an explanation of your answer. No credit for numbers with no indication of where they came from.

The table of critical values for Student's t distribution (Appendix A6 in Wild and Seber) is attached. You may need to use it in one or more problems.

The points for the questions total to 100. There are 3 pages and 4 problems.

1. [25 pts.] Acme Widget Works has a 1% defect rate producing widgets, meaning only 1 widget in 100 is defective. Widgets come in boxes of 24. Assuming widget defects are statistically independent events, what is the probability of a box of 24 widgets having no defective widgets?

2. [25 pts.] Some poll results on Governor Ventura's job performance

	October '99	July '00
Excellent	7%	14%
Good	36%	42%
Fair	31%	30%
Poor	25%	13%
Undecided	1%	1%

Both polls gave their margin of error as 4%.

(a) Note that 43% of the voters rated the governor's job performance "good" or "excellent" in the fall of '99 but 56% rated him that way last summer. What is an appropriate margin of error for the 13% change in these two categories between the two polls? (You do not have to be precise. The "mental adjustments" recommended by Wild and Seber will do. But do have to explain your reasoning. A number with no explanation gets no credit.)

The second poll also reported on the job performance of the state legislature.

	July '00
Excellent	2%
Good	39%
Fair	43%
Poor	14%
Undecided	2%

(b) Note that 41% of the voters rated the legislature's job performance "good" or "excellent" as opposed to the governor's 56% in these two categories. What is an appropriate margin of error for the 15% difference between the governor and the legislature? (The comments for the other part apply here too.)

3. [25 pts.] A scientist measured tail lengths of 10 wild field mice. The mean was 10.7 cm and the standard deviation was 2.4 cm. Assume the measured mice were a random sample from some specified wild population.

   (a) Calculate a 95% confidence interval for the mean tail length of the population (either interval or plus-or-minus form is acceptable).

   (b) What is being assumed, other than what is specified in the problem statement, for the confidence interval in part (a) to be correct?

   (c) What would you do different from part (a) to calculate a 90% confidence interval? (You don't need to actually do the interval, just the part of the calculation that is different.)

4. [25 pts.] Consider the following regression printout from R

```
Rweb:> summary(out)

Call:
lm(formula = sally ~ fred)

Residuals:
    Min      1Q  Median      3Q     Max
-1.9602 -1.0688 -0.2302  0.8028  2.2471

Coefficients:
```

```
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  10.1940     0.2689  37.905  < 2e-16
fred          1.0152     0.2719   3.733  0.00152

Residual standard error: 1.202 on 18 degrees of freedom
Multiple R-Squared: 0.4364,     Adjusted R-squared: 0.405
F-statistic: 13.94 on 1 and 18 degrees of freedom,      p-value: 0.001523
```

Calculate a 95% confidence interval for the slope of the regression line associated with this printout.