Lab 10 Grading Standard:

1) *In grading, do not explicitly assign points to the various sections. Rather, take points off for incorrect, incomplete or missing items.*
2) *When you take point off, be sure to write a short comment as to why the points were lost.*
3) *Example: (-1) What is the measured value of the component?*
   (-3) What is the mathematical formula that you are plotting on top of your data?

General Notes:

- The axis of all plots must be labeled. This should include the quantity, the units and numerical values.
- The boxed questions should be answered in the lab book.
- Procedures must have a circuit diagram.
- Measured values of components used should be recorded in the lab book.
- Relevant formulas should be included in the lab book.
- Formulas for computed quantities in tables should be near the table in the book.

Failure to measure a component value when possible (max -1 per occurrence)
Missing units on components, plot axes, tables … (-1 per occurrence).
Missing plot (-4 per occurrence).
Missing axes labels on plots (-1 per label).
Missing column labels on tables (-1 per label).
Missing formula for computed quantity in table (-1 per table)--can be in column title
Missing important formulas (-2 per occurrence)
No fit to linear curves (-2 per occurrence).
No fit values with units (-2 per occurrence).
No comparison of fit values with expectations when possible (-2 per occurrence).
Missing theoretical calculations, including formulas (-3 per occurrence).
Failure to answer questions (-2 per question, maximum of -10)

Note: There is no pre-lab for lab 9.

Purpose/Introduction 5

There should be a two to five line description of what they are going to do in this lab. This is all or nothing for five points.

The Integrator:

Procedure: 5

There should be a several line procedure that shows the circuit, indicates where they are going to measure voltages, what the measured values of the components are. They should explain the component values that they chose for the two resistors and the capacitor.

Frequency Response: 15

Measurements of the frequency response for the integrator circuit. This should include data from below their omega-rc up to at least 1 MHz. They need to present this as a Bode Plot. They should also note what the relative phase of the input to the output is, but they do not need to make a plot. Their Bode plot should show a flat region at low frequencies where they have a low-pass filter, followed by the the 1/omega fall off at higher frequencies.

Squarewave Input: 10

There should be a brief explanation of what the measurement will be. The data should consist of frequency and amplitude of the square wave. The output should be a triangle wave whose slope matches the area (modulo RC factors) under the square wave. They need to show that this is numerically correct. They should comment on issues when the frequency is too low, and other wave forms, but no
Numerical work is needed.

The Differentiator:

Procedure: 5

There should be a several line procedure that shows the circuit, indicates where they are going to measure voltages, what the measured values of the components are. They should explain the component values that they chose for the two resistors and the capacitor.

Frequency Response: 15

Measurements of the frequency response for the differentiator circuit. This should include data from below their omega-rc up to at least 1 MHz. They need to present this as a Bode Plot. They should also note what the relative phase of the input to the output is, but they do not need to make a plot. Their Bode plot should show a fries at low frequencies, it may then flatten out for middle frequencies, and then fall off like the open-loop gain at high frequencies.

Square and Triangle wave Input: 10

There should be a brief explanation of what the measurement will be. The data for the triangle wave should consist of the slope of the input wave and the amplitude of the resulting square wave. The output amplitude should match the slope of the input (modulo RC factors). They need to show that this is numerically correct. They should comment on issues when the frequency is too low, and the square wave, but no Numerical work is needed.

The Logarithmic Amplifier:

Procedure: 5

There should be a several line procedure that shows the circuit, indicates where they are going to measure voltages, what the measured values of the components are. They should explain the component values that they chose.

Measurement : 15

They should collect sufficient data to measure the logarithmic behavior. They should then provide a plot of their data. They need to fit their data to obtain VT and I0. VT's tend to be a bit high, with values up to 75 or 80mV not uncommon. I0 tends to be in the nanoamp range.

Questions 10

Conclusion/Summary 5