Some Review Questions for Prelim 2 (not comprehensive)

Here is how it works: Ask yourseves the following questions. If you can answer all of them in your head without using the textbook or note, you are in good shape to tackle the prelim.

1. Fill in the blank.
a. When using IBP, $\int udv = uv - \int vdu$ we look for u to be easily ...., and v to be easily....
b. $d(\sin x) = ...$
$d(\cos x) = ...$
$d(\tan x) = ...$
$d(\sec x) = ...$
$d(\cot x) = ...$
$d(\csc x) = ...$
2. What are some special tricks associated with IBP? Give examples.

3. For what integers m,n you can evaluate $\int \cos^n(x) \sin^m(x)dx$, $\int \cos mx \sin nxdx$?

4a. Explain 2 reasons why we have to carefully specify the domain when using trig substitutions. What are the common domains for each type of trig substitution?

4b. How do we choose which trig substitution to use? Give examples.

5. When we decompose rational functions into partial fractions, what are the denominators? Briefly explain the Heaviside method and give an example.

6. How does the Trapezoid rule differ from the Simpson's in terms of execution and error estimate?

7. What assumptions can be removed from the definition of a definite integral? How is removing these assumptions related to defining improper integrals?

7b. What does it mean for an improper integral to be convergent or divergent? What are some common tests to determine if an improper integral converges or diverges? Give examples.

8. What is a first order differential equation? How do we draw the slope field associated to one such equation. What do we learn from the slope field?

9. Distinguish a first order separable DE from a linear one? Can one equation be both separable and linear? What is the general strategy to solve each type of equation?

10. What is an integrating factor? How do we calculate it? How much physics/chemistry/economics did you learn from all presentations? Give examples.

11. What are critical points and equilibrium solutions of a DE?