Name: _____

Please show all work and justify your statements. Make and label sketches, draw conclusions (using complete sentences and including units), and box the final answers as appropriate. Remember, in problems involving medical science, your patient's life depends on the accuracy of your answers! ☺

1. Find dy/dx if $2^{\cosh y} = y \ln x$.

2. For which value of a does $f(x) = xe^{ax}$ have a critical point at $x = 2$? Compute the second derivative of f and use it to determine the nature of the above critical point.

3. A herniated disc grows at the rate of 1 cm^3/year. Assuming the thickness is constant 0.25 cm, how fast is the diameter of the disc growing when it is 4 cm?

4. A drug is administered to a patient in the following manner. The rate of delivery starts at 20 mg/min and during the first 10 minutes is increased linearly to 50 mg/min. During the next 5 minutes the rate is decreased linearly from 50 mg/min to 30 mg/min.

   Assuming that the drug is cleared from the body at the constant rate of 10 mg/min, what is the accumulation of the drug at the end of treatment? Sketch the amount of the drug in the body as a function of time during the course of treatment.

5. Evaluate the following integrals analytically. Show all steps.

$$\text{(a)} \int_1^4 \frac{1+t}{\sqrt{t}}\, dt \qquad \text{(b)} \int_0^1 \sin(\pi t)\, dt$$

1	2	3	4	5	total (50)	%

Prelim. course grade: _____ %