Math 1B Discussion Section Problems

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You should work on the following problems in groups of 3 or 4. Try to get through as many as you can, but you aren't expected to finish everything. Instead, you should make sure everyone in your group knows **how** to solve all the problems, and not just the answers.

1. Consider the function $f(x) = 1/x$ for $1 \leq x < \infty$
   (a) Show that the area under this curve is infinite
   (b) Show that the length of this curve is infinite
   (c) Show that the surface area obtained by rotating it around the x-axis is infinite.
   (d) Show that despite parts (a) - (c), the **volume** of the solid obtained by rotating it around the x-axis is actually finite
2. A sphere can be thought of as a half-circle rotated around the x-axis. In the same way, rotating a half-ellipse gives something called an ellipsoid. Find the surface area of the ellipse you get by rotating the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ around the x-axis.
3. Practice Integration: these problems are not directly related to sections 8.1 and 8.2, but should be good practice in doing integrals. After you finish, think about what makes each of (f)-(h) different.
   (a) $\int e^{x+e^x} dx$
   (b) $\int x^2 \tan^{-1} x dx$
   (c) $\int \frac{1}{\sqrt{x+1}+\sqrt{x}} dx$
   (d) $\int \frac{\ln(x+1)}{x^2} dx$
   (e) $\int \frac{t^3+1}{t^3-t^2} dt$
   (f) $\int \frac{1}{x\sqrt{x^2+4}} dx$
   (g) $\int \frac{1}{x\sqrt{x+4}} dx$
   (h) $\int \frac{x}{\sqrt{x^2+4}} dx$