Name: ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯   ⎯⎯⎯⎯⎯ **/ 25**

There are 25 points possible on this quiz. No aids (book, calculator, etc.) are permitted. **Show all work for full credit.**

1. **[9 points]** Find the radius r and height h of the cylinder with surface area 24π that has the largest possible volume. The formulas for the volume V and surface area S are given below.

$$V = \pi r^2 h, \qquad S = 2\pi r^2 + 2\pi rh$$

    a. State the value that you want to maximize/minimize.

    b. Write the value from part (a) as a function of a single variable.

    c. Answer the original question and use calculus to justify your answer.

2. **[8 points]** Use L'Hôpital's Rule to evaluate the limits below. Indicate your use of L'Hôpital's Rule with $\overset{h}{=}$ or $\overset{L'H}{=}$ or something similar. (Be sure to verify explicitly that L'Hôpital's Rule applies!).

    a. $\displaystyle\lim_{x\to 1^+} \frac{x+\cos(\pi)}{\ln(x)}$

    b. $\displaystyle\lim_{x\to 0^+} x^x$

3. **[8 points]** Evaluate the following antiderivatives (aka indefinite integrals).

    a. $\displaystyle\int (x^3 - 4e^x - \cos(x) + \ln(2))\,dx$

    b. $\displaystyle\int \frac{x^{3.6} + \sqrt{x}}{x^2}\,dx$