Name:

Math Practice 116 Exam 1

1) Find the first derivative for the following functions.

a) $f(x) = \ln(\sqrt{x})$, $0 < x$.

b) $g(x) = x \arcsin(2x)$

c) $h(x) = 8^{\cos(x)}$

2) Solve the following non-calculus problem.

You are an unusually precocious student beginning your freshman year in high school. Your moneyed uncle has given you $12,000 to pay for a college education. Having a vested interest in your success, Gabriel will offer you a rate of 8% per year on your initial investment based on California Angels ticket revenues, while Mephistopheles counters with 15% per year on Tampa Bay Devil Rays revenue, both compounded continuously. You may only choose one offer.

a) How much would you have in either account before you start college?

b) The catch to Mephistopheles' offer is that if you agree to it and you do not have enough money to obtain your degree in four years, you lose your soul. If college costs $10,000 per year and you pay for each year in full before it begins, should you take Mephistopheles' deal? Support your assertion with calculations.

3) Evaluate the following indefinite integrals.

a) $\int (4x)^3 \ln(8x)\, dx$

b) $\int \dfrac{2x^5 - 3}{x^3 - x^2 - 2x}\, dx$

4) Compute the following limits.

a) $\lim_{x \to \frac{\pi}{2}^-} \left(\csc\left(\frac{\pi}{2} - x\right) - \sec(x) \right)$

b) $\lim_{x \to \infty} \left(1 + \frac{1}{\ln(x^3)}\right)^{\ln(x)}$

5) Evaluate the following definite integrals.

a) $\displaystyle\int_0^{\frac{7\sqrt{3}}{2}} \sqrt{49 - x^2}\, dx$

b) $\displaystyle\int_4^9 \frac{8}{x^{3/2} + \sqrt{x}}\, dx$