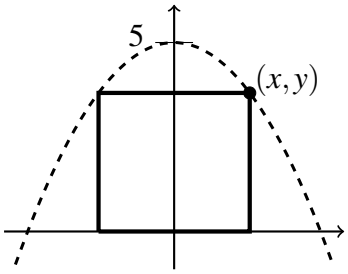
Name: _____ _____ **/ 25**

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

1. [8 points] (optimization) Determine the dimensions of the largest rectangle that can be inscribed in the region below the curve $y = 5 - \frac{1}{3}x^2$ and above the x-axis. Assume the base of the rectangle lies on the x axis. (See figure below.)



a. Identify the objective function. That is, identify the quantity to be maximized or minimized.

b. Write the objective function as a function of x.

c. Answer the question and use Calculus to demonstrate that you answer is correct. (That is, you need to show that you have found a minimum or maximum.)

Dimensions of the largest rectangle are: **base**= _____ **height**= _____

2. [9 points] Evaluate the following limits. You must show your work to earn full credit. If you apply L'Hopital's Rule, you should indicate this.

a. $\lim_{x\to 0} \dfrac{2e^x - 2x - 2}{3x^2}$

b. $\lim_{x\to 0} \dfrac{2x^2 - 5x}{\cos(x)}$

c. $\lim_{x\to 0^+} x\ln(x^4)$

3. [8 points] Evaluate the following indefinite integrals. You must show your work to earn full credit. If you apply L'Hopital's Rule, you should indicate this.

a. $\int (x^{1/2} + \sin(x) + 5e^x)\,dx$

b. $\int \left(\sec^2(x) + \dfrac{x+1}{x}\right) dx$