**MA 123**
**Calculus I**
Practice Final Exam

Please Note: The final exam will **not** be restricted to the questions below. Although the final is not directly cumulative, it will demand knowledge of concepts covered on the previous midterm exams. This practice final has been devised to take far longer than the 2 hour allotment for the actual final. Be aware that some of the proceeding questions require the use of a calculator/electronic device.

1.) Evaluate the following indefinite integrals.

a.) $\int \frac{\sin\vartheta + \sin\vartheta \tan^2\vartheta}{\sec^2\vartheta}\, d\vartheta$

b.) $\int \frac{1}{(5t+4)^{2.7}}\, dt$

c.) $\int \frac{\tan^{-1} x}{1+x^2}\, dx$

d.) $\int \frac{r^3}{\sqrt{4+r^2}}\, dr$

e.) $\int (\ln x)^2\, dx$

2.) Use Newton's method to approximate the given number correct to eight decimal places.

a.) $\sqrt[7]{1000}$

3.) The velocity function (in meters per second) is given for a particle moving along a line. Find (a.) the displacement, and (b.) the distance traveled by the particle during the given time interval

$$v(t) = t^2 - 2t - 8 \qquad 1 \le t \le 6$$

4.) A spotlight on the ground shines on a wall 12 m away. If a man 2 m tall walks from the spotlight toward the building at a speed of 1.6 m/s, how fast is the length of his shadow on the building decreasing when he is 4 m from the building?

5.) Find the dimension of the largest area that can be inscribed in an equilateral triangle of side L if one side of the rectangle lies on the base of the triangle.

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6.) Find the derivative of the following function.

$$g(x) = \int_{2x}^{3x} \frac{u^2 - 1}{u^2 + 1}\, du$$

7.) Find the interval on which the curve

$$y = \int_{0}^{x} \frac{1}{1 + t + t^2}\, dt$$

is concave upward.

**Final Exam: Thurs, June 26th at 6 pm in MCS B33**

**No Calculators Permitted**