APPM 1350 EXAM 3 SUMMER 2007

INSTRUCTIONS: Books, notes, and electronic devices are not permitted. Write your (1) name and (2) instructor's name on the front of your bluebook. Work all **5 problems**. Start each problem on a **new page**. Show your work clearly and box your final answer. A correct answer with incorrect or no supporting work may receive no credit, while an incorrect answer with relevant work may receive partial credit.

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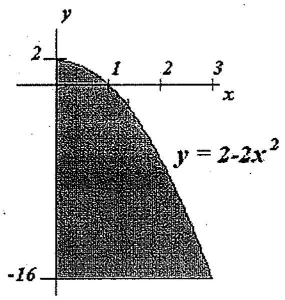
1. *(35 points)*

a) Evaluate $\int\left(5x^4+8x^3-x-3-\frac{1}{x^2}\right)dx$

b) Evaluate $\int\frac{\cos^3 x+1}{\cos^2 x}\,dx$

c) Find the shaded area of



d) Find the area under the curve $f(x)=|x-1|+2$ and the x-axis for $0\le x\le 2$

2. *(30 points)* Consider the integral $I=\int_{-2}^{1}\left(x^4+1\right)dx$. Suppose we want to estimate the value of I by using numerical integration.

- **a)** Estimate I using a **left hand** approximation with 3 rectangles (Riemann Sum)
- **b)** Estimate I by using 3 trapezoids (Trapezoidal Rule)
- **c)** Evaluate $I=\int_{-2}^{1}\left(x^4+1\right)dx$ exactly
- **d)** Find the minimum number of subintervals n needed to approximate the integral with an error of magnitude less than .0108 using the trapezoidal rule.

$$Hint: |E_T|\le\frac{b-a}{12}h^2M$$

3. *(15 points)*

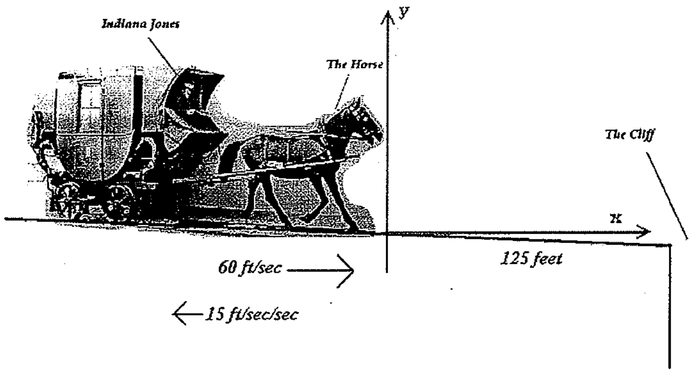
Show that if $h>0$, applying Newton's Method to

$$f(x)=\begin{cases}\sqrt{x} & x\ge 0\\ \sqrt{-x} & x<0\end{cases}$$

leads to $x_1=-h$ if $x_0=h$ and to $x_1=h$ if $x_0=-h$. Draw a picture that shows what is going on.

THERE ARE TWO MORE ON THE BACK

4. *(20 points)* **Indiana Jones Revisited:**
Indiana Jones is trying to control another runaway horse drawn carriage. The horse is running at **60 ft/sec** (which is approximately 40 mph) and is approaching a new cliff. At **125 feet** away from the cliff, *Jones* finally gets ahold of the reins and applies the "brakes" at a constant rate of **15 ft/sec/sec**. Use calculus to determine if *Jones* stops the carriage in time?



5. *(25 points)* The figure below shows two right circular cones, one upside down inside the other. The two bases are parallel, and the vertex of the smaller cone lies at the center of the larger cone's base. What values of ***r*** and ***h*** will give the smaller cone the largest possible volume?