

### Practice Problems for Exam #3

1. Suppose the first derivative of  $y = f(x)$  is  $y' = x^{-1/3}(x - 1)$ . Find all critical points, local extrema, and points of inflection. Also, determine where  $f(x)$  is increasing, decreasing, concave up and concave down.

2. Sketch the graph of a function which satisfies all the following conditions:

$$y' > 0 \quad 0 < x < 1, 2 < x < \infty$$

$$y' < 0 \quad -\infty < x < 0, 1 < x < 2$$

$$y'' > 0 \quad -\infty < x < 1, 1 < x < 3$$

$$y'' < 0 \quad 3 < x < \infty$$

3. What are the dimensions of the lightest open-top right circular can that will hold a volume of  $1000 \text{ cm}^3$ ?

4. Use Newton's method to approximate  $\sqrt[3]{3}$ . Start with  $x_0 = 1$  and find  $x_2$ .

5. Find the most general antiderivative. Show all steps and check your answers by differentiation.

a)  $\int -7 \sin \theta \, d\theta$

b)  $\int \frac{1 - x^3}{x^5} \, dx$

c)  $\int 2y(y^{1/2} - y^{3/2}) \, dy$

6. Estimate the area under the graph of  $y = \sin(x)$  on  $[0, \pi]$ . Use four rectangles and left endpoints. Draw an appropriate picture. Repeat for right endpoints.

7. Find a general formula for the upper Riemann sum of  $x^4$  on  $[0, 2]$ . (You don't need to evaluate the sum or find the limit.)

8. Evaluate the definite integral  $\int_{-1}^3 2 + |x| \, dx$ .