Name_____

4/27/05

Answer 3 of the following 4 open response problems. Problems will be graded in the same manner as AP open response problems. In the spaces below, indicated which 3 problems you would like graded. Only the problems you indicate below will be graded.

I would like problems _____, _____, and _____ graded.

Problem 1

Consider the curve given by $xy^2 - x^3 y = 6$

a. Show that $\frac{dy}{dx} = \frac{3x^2 y - y^2}{2xy - x^3}$

b. Find all points on the curve whose x-coordinate is 1 and write an equation for the tangent line at each of these points.

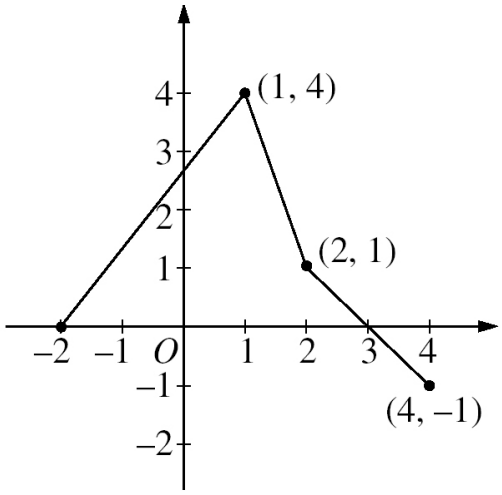
c. Find the x-coordinate of each point on the curve where the tangent line is vertical.

Problem 2

The graph of the function, f, consisting of three line segments, is given below.

Let $g(x) = \int_1^x f(t)dt$.

a. Compute $g(4)$ and $g(-2)$.



b. Find the instantaneous rate of change of g, with respect to x, at $x = 1$.

c. Find the absolute minimum value of g on the closed interval [-2,4]. Justify your answer.

d. The second derivative of g is not defined at $x = 1$ and $x = 2$. Which of these values are x-coordinates of points of inflection of the graph of g? Justify your answer.

Problem 3

t (hours)	$R(t)$ (gallons per hour)
0	9.6
3	10.4
6	10.8
9	11.2
12	11.4
15	11.3
18	10.7
21	10.2
24	9.6

The rate at which water flows out of a pipe, in gallons per hour, is given by a differentiable function of time t. The table above shows the rate as measured every 3 hours for a 24 hour period.

a. Use a midpoint Riemann sum with 4 equal sub-divisions to approximate $\int_0^{24} R(t)dt$. Using correct units, explain the meaning of your answer in terms of water flow.

b. Is there some time t, $0 < t < 24$, such that $R'(t) = 0$? Justify your answer.

c. The rate of water flow $R(t)$ can be approximated by the quadratic function $Q(t) = \frac{1}{79}(768 + 23t - t^2)$. Use $Q(t)$ to approximate the average rate of water flow during the 24-hour time period. Indicate units of measure.

Problem 4

Consider region **R** bounded by the line $y = x - 1$, the parabola $y^2 = 2x + 6$, and the x-axis.

a. Draw a detailed sketch of region R.

b. Find the area of region **R**.

c. Find the volume of revolution if region **R** is rotated around the line $x = 5$.