Calculus I Name: ______________________________

Fall 2007

Instructions: You have 65 minutes for this exam. The exam is closed book, closed notes. A calculator is allowed, but you must show all of your work. **Your work is your answer.** If you have any questions, please ask immediately! Good luck.

PRACTICE EXAM

Problem #1:

Find the derivative of the following (A is a constant):

a) $f(x) = \frac{A^2}{x^7} - A\sqrt[16]{x - A}$

b) $f(x) = x^e - Ae^x + \ln(A^5 x) - \sin(Ax)$

Problem #2:

Find all antiderivatives of $g(t) = t^{1/5} - \frac{1}{\sqrt{2t^3}} + \cos(t)$

Problem #3:

Check that $y = -\frac{1}{t+C}$ is a solution to the differential equation:

$$y' = y^2.$$

Problem #4:

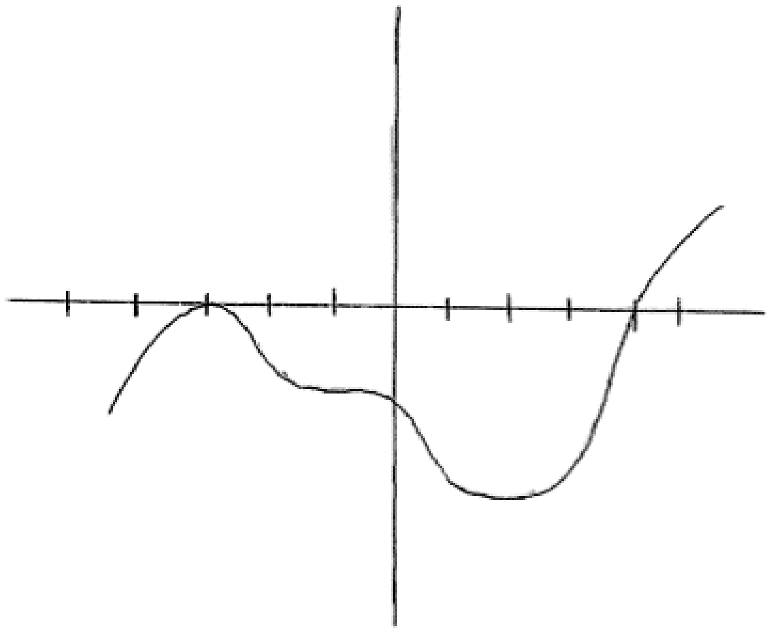
Let $h(x) = e^x - \ln(x)$.

a) Find the equation of the line throught the points $(3 - d, h(3 - d))$ and $(3, h(3))$.

b) Carefully explain how you could use your answer from part a) to calculate $h'(3)$. Your answer should use a diagram to help your explanation.

c) Find the equation of the line tangent to $h(x)$ at $x = e$. (You should not use your work from parts a) and b).)

For Problems #5 and #6 use the graph of the function $f(x)$ below.



Problem #5:

Sketch (on a new set of axes) the graph of the **derivative** for $f(x)$.

Problem #6:

Sketch (on a new set of axes) the graph of a possible antiderivative for $f(x)$.

Problem #7:

Consider $f(x) = \frac{1}{\sqrt{x-2}}$. Find $f'(x)$ **using the definition of the derivative**. No credit will be given for any other method of obtaining the answer.

Problem #8:

Find the point on the graph of $y = \frac{1}{x} + x$ which is closest to the origin.

(Hint: the distance between two points is $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$, but you may minimize the **square** of the distance.)

Problem #9:

Gilda Smith is a goldsmith in Gaul who gilds goblets. She is going to gild the outside of a triangular goblet with volume 200 cm^3. The ends of the goblet are equilateral triangles with sides of length s cm (one of the ends is open). The goblet is w cm tall. She is galled to discover that the goldsmiths' guild specifies that the gold for the triangular bottom of the goblet costs 6 guilders per cm^2 and the gold for the sides costs 10 guilders per cm^2. What length s will minimize the total cost for the gold?

The area of an equilateral triangle with sides of length s is $\frac{\sqrt{3}}{2}s^2$. The volume of the goblet described is $\frac{\sqrt{3}}{2}s^2 w$.

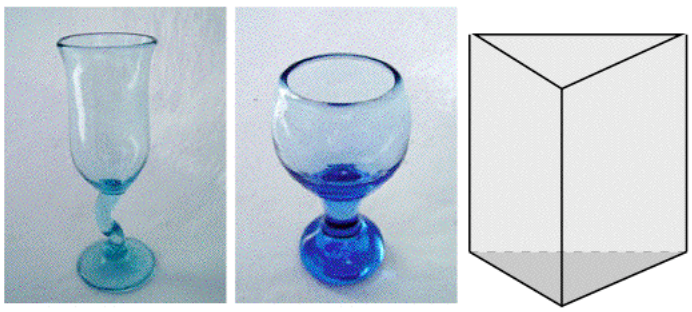


FIGURE 1. Some of Gilda's goblets