18.01 EXAM 2
OCTOBER 3, 2003

Name: _____

Problem 1: _____ /30

Problem 2: _____ /25

Problem 3: _____ /15

Problem 4: _____ /30

Please write the hour of your recitation.

Total: _____ /100

Hour: _____

Instructions: *Please write your name at the top of every page of the exam.* The exam is closed book, calculators are not allowed, but you are allowed to use your prepared index card. You will have approximately 50 minutes for this exam. The point value of each problem is written next to the problem – use your time wisely. Please show all work, unless instructed otherwise. Partial credit will be given only for work shown.

You may use either pencil or ink. If you have a question, need extra paper, need to use the restroom, etc., raise your hand.

Date: Spring 2001.

Name: _____ **Problem 1**: _____ /30

Problem 1(30 points) Sketch the graph of

$$y = \frac{x^3}{x^2 - 1}$$

on the interval $(-3, 3)$. Label and give the type of all discontinuities, label all asymptotes, say the behavior at infinity, and label all local maximums and minimums (give the coordinates of such points). For purposes of graphing, $\sqrt{3} \sim 1.73$. Show all work.

Name: _____ **Problem 2**: _____ /25

Problem 2(25 points) Let C be the parabola that is the graph of $y = \frac{1}{2}x^2$. Let P be the point $(4, 1)$. Find the coordinates of the point on C that is closest to P. Show all work and circle your answer.

Name: _____ **Problem 3**: _____ /15

Problem 3(15 points) Find the quadratic approximation of

$$f(x) = \ln(\sin(x))$$

near the point $x = \frac{\pi}{2}$. Show all work and circle your answer.

Name: _____ **Problem 4**: _____ /30

Problem 4(30 points) A point Q_1 moves along the positive x-axis with a constant velocity $-20\frac{\text{m}}{\text{s}}$. A point Q_2 moves along the positive y-axis with a constant velocity $+10\frac{\text{m}}{\text{s}}$. At time t, the line segment Q_1Q_2 makes an angle of $\theta(t)$ at Q_1, measured clockwise from the x-axis to the line segment (so that $0 < \theta(t) < \frac{\pi}{2}$). At a certain moment Q_1 is 5m from the origin and Q_2 is 5m from the origin. Compute the rate of change $\frac{d\theta}{dt}$ at this moment in units of radians per second. (Hint: What is $\tan(\theta)$?)