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18.01 Single Variable Calculus
Fall 2006

18.01 Exam 2

Tuesday, Oct. 17, 2006

Problem 1. (15 pts.) Estimate the following to two decimal places (show work)

    a. (8 pts.) $\sin(\pi + 1/100)$

    b. (7 pts.) $\sqrt{101}$

Problem 2. (20 pts.) Sketch the graph of $y = \dfrac{4}{x} + x + 1$ on $-\infty < x < \infty$
and label all critical points and infection points with their coordinates on the graph along with the letter "C" or "I"

Problem 3. (20 pts.) An architect plans to build a triangular enclosure with a fence on two sides and a wall on the third side. Each of the fence segments has fixed Length L. What is the length x of the third side if the region enclosed has the largest possible area? Show work and include an argument to show that your answer really gives the maximum area.

Problem4. (15 pts) A rocket has launched straight up, and its altitude is h = 10t² feet after t seconds. You are on the ground 1000 feet from the launch site. The line of sight from you to the rocket makes an angle θ with the horizontal. By how many Radians per second is θ changing ten seconds after the launch?

Write down on which intervals the function is:

Increasing:

Decreasing:

Concave down:

Problem 5. a. (10 pts) Evaluate the following indefinite integrals

i. $\int \cos(3x)dx$

ii. $\int xe^{(x^2)}dx$

b. (10 pts) Find $y(x)$ such that $y' = \dfrac{1}{y^3}$ and $y(0)=1$

Problem 6. (10 pts.) Suppose that $f'(x)=e^{(x^2)}$, and $f(0)=10$
One can conclude from the mean value theorem that

$$A < f(1) < B$$

for which numbers A and B?