

Math 100, Section 105
Problem Set 5

Due: November 29th, 2010

Student number:

LAST name:

First name:

Mark:

Instructions

- Please print this sheet out and write your student number, last name (all capitals) and first name. Please use your “official” name as it appears in the student registry even if you prefer to be called by another name — this is needed for the grader to enter your grade in the system.
- Use this page as a cover sheet for your solutions, but do not write your solutions on it. STAPLE your pages together; lost pages are your responsibility.
- Due at the beginning of class on the date indicated; late work will not be accepted.
- Place in the pigeonhole corresponding to the first letter of your last name.

Problems

1. Find a function whose derivative is the given function: (a) x^2 (b) $x^3 + 2x$ (c) $\cos(3x)$.
2. In class we considered the function

$$f(x) = \frac{\sqrt{(x - x_A)^2 + y_A^2}}{v_A} + \frac{\sqrt{(x - x_B)^2 + y_B^2}}{v_B}.$$

In particular, we found a point x_0 where $f'(x_0) = 0$ and argued that it is a minimum of f .

- (a) Evaluate the second derivative $f''(x)$.
 - (b) Show that $f''(x) > 0$ for all x .
 - (c) Conclude that x_0 was indeed a local minimum explain why there cannot be other critical points.
3. (From the 2008 final exam) A cylindrical can without a top is made to contain $27\pi\text{cm}^3$ of liquid. Determine (with justification) the dimensions of the can that minimize the area of the metal used to make the can. Hint: The metal used consists of a disc (the bottom of the can), and a rectangle (the sides of the can) bent into a cylinder.