

# 18.01 FALL 2009 – Problem Set 2A

Due Friday 10/2/08, 1:45 pm in 2-106

2A is the first half of Problem Set 2, all of which is due a week after Exam 1 (the second half, 2B, will be issued the day before the exam). Even though it won't be collected until later, you should do 2A before the exam, to prepare for material on the test.

## Part I (15 points)

**Lecture 5.** Fri. Sept. 18 Implicit differentiation; inverse functions and their derivatives.

Read: 3.5, Notes G section 5, 9.5 (bottom p.313 - 315)

Work: 1F-3,5,8ac; 1G-4; 1A-5b; 5A-1abc (just sin, cos, sec); 5A-3f,g,h

**Lecture 6.** Tues. Sept. 22 Exponentials and logs: def'n, algebra, applications, derivatives.

Read: Notes X (8.2 has some of this), 8.3 to middle p. 267; 8.4 to top p. 271

Work: 1H-1a,b, 2, 3a, 5b; 1I-1c,d,e,f,m; 1I-4a

**Lecture 7.** Thurs. Sept. 24 Logarithmic differentiation. Hyperbolic functions (which are not on exam). Review.

Read: 9.7 to p. 326 Work: 5A-5abc

**Lecture 8.** Fri. Sept. 25 **Exam 1** In-class, covering 0-7.

Students not passing the exam will receive an e-mail on Friday evening. Make-up exams are offered Monday-Thursday of the week following at times posted at the web site (see "Exams" section of the course website's home page). We will announce the location of the exam next week in class and on the website.

## Part II (32 points)

**Directions:** Attempt to solve *each part* of each problem yourself. If you collaborate, solutions must be written up independently. It is illegal to consult materials from previous semesters. With each problem is the day it can be done.

**0.** (not until due date; 2 points) Write the names of all the people you consulted or with whom you collaborated and the resources you used, or say "none" or "no consultation". (See full explanation on PS1).

**1.** (9/15; 4 pts) Graph the even and odd functions you found in Problem 1, Part II of PS1. Directly below, graph their derivatives. Do this qualitatively using your estimation of the slope. Do not use the formulas for the derivatives (except to check your work if you want). You can use a graphing calculator to check your answer, provided that you mention it in Problem 0. (Note, however, that you may not use books, notes or calculators during tests, so it is unwise to rely on a graphing calculator here.)

**2.** (9/17; 5 pts = 2 + 3) Compute

a)  $(d/dx) \tan^3(x^4)$

b)  $(d/dy)(\sin^2 y \cos^2 y)$

(Do this two ways: first use the product rule, then write it as  $f(2y)$ . Show that the answers agree.)

**3.** (Fri; 4 pts = 3 +1)

a) The function  $\cos^{-1} x$  is the inverse of the  $\cos \theta$  on  $0 \leq \theta \leq \pi$ . Use implicit differentiation to derive the formula for  $(d/dx) \cos^{-1} x$ . Pay particular attention to the sign of the square root. (See the book or lecture for the case of the inverse of sine.)

b) Without calculation, explain why  $(d/dx) \cos^{-1} x + (d/dx) \sin^{-1} x = 0$

**4.** (Tues + Thurs; 12pts = 2+2+2+2+2+2) Do 8.2/8ac, 10, 11, 12; 8.4/18,19a.

**5.** (Thurs.; 2 pts) Compute  $(d/dx)x^x$ .

**6.** (Thurs; 3 pts) Derive the formula for  $D(u_1 u_2 \cdots u_n)$  from PS1, Part II, 7b, using logarithmic differentiation.