

**MATH 221: Calculus and Analytic Geometry**  
**Prof. Ram, Spring 2000**

**Lecture 3: MIDTERM EXAM 1**  
**September 25, 2000**

This is a 50 minute exam. No books, notes or calculators are allowed. There are 12 problems on this exam. All problems are worth 10 points each. Doing the easier ones first will probably help to maximize your total points.

**Name:** \_\_\_\_\_

**TA and Section:** \_\_\_\_\_

Problem	Score
1.	
2.	
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12.	
Total	

**Problem 1.** Explain why  $\frac{d \tan^{-1} x}{dx} = \frac{1}{1+x^2}$ .

**Problem 2.** Find  $\frac{dy}{dx}$  when  $y = \frac{\sin 2x}{\cos x}$ .

**Problem 3.** Explain why  $\frac{de^x}{dx} = e^x$ .

**Problem 4.** Verify the identity  $\cos^2 \theta = \frac{\cot^2 \theta}{1 + \cot^2 \theta}$ .

**Problem 5.** Verify the identity  $\frac{\cos 2A}{1 + \sin 2A} = \frac{\cot A - 1}{\cot A + 1}$ .

**Problem 6.** Verify the identity  $\cos 3x = \cos^3 x - 3 \cos x \sin^2 x$ .

**Problem 7.** Find  $\frac{dy}{dx}$  when  $x = a\frac{1+t^2}{1-t^2}$  and  $y = \frac{2bt}{1-t^2}$ , and  $a$  and  $b$  are constants.



**Problem 8.** Let  $g$  be a function. Show that  $\frac{dg^1}{dx} = 1g^0 \frac{dg}{dx}$ .

**Problem 9.** Verify the identity  $\cos^2 x + \sin^2 x = 1$ .

**Problem 10.** Compute  $\sin \frac{\pi}{4} + \cos \frac{\pi}{3}$  in radical form.

**Problem 11.** Verify the identity  $\frac{\cos A + \sin A}{\cos A - \sin A} = \frac{1 + \sin 2A}{\cos 2A}$ .

**Problem 12.** Find  $\frac{dy}{dx}\Big|_{x=2}$  when  $y = x^2 + x + 2$ .