

Math 1A Midterm 1 2012 Sept 25 3:30pm-5:00pm

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Name	Student ID	Name of GSI
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You are allowed 1 sheet of notes. Calculators are not allowed. Each question is worth 3 marks, which will only be given for correct working and a clear and correct answer in simplified form. Write the final answer to each question on this cover-sheet.

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1. Sketch the graph of  $y = 1/(1 + x^2)$  for  $0 \leq x \leq 2$  and sketch the graph of its inverse function.

2. Sketch the graph of the function  $f(x) = 1/(1 + e^{1/x})$ .

3. Evaluate the limit

$$\lim_{x \rightarrow -4} \frac{\sqrt{x^2 + 9} - 5}{x + 4}$$

4. Show that there is a number  $x$  such that  $\arctan(x) = 10x - 20$ , and find an integer  $n$  with  $n \leq x \leq n + 1$ .

5. What is

$$\lim_{x \rightarrow -\infty} \frac{\sqrt{9x^6 - x}}{x^3 + 1}$$

6. Find the equation of the tangent line to the curve  $y = \frac{2x+1}{x+2}$  at the point where  $x = 1$ .

7. State the definition of the derivative of a function, and find the derivative of the function  $f(x) = x^3$  using the definition of the derivative.

8. Sketch the graph of a function whose derivative is  $1 + \cos(x)$ .

9. Differentiate the function  $y = 2^{20} + x^{5/3} + e^{x+2}$ .

10. Differentiate  $x^3e^{-x}$ .

11. Find the coefficient of  $x^6y^4$  in the binomial expansion of  $(x + y)^{10}$ .