

## Math 16A; Sample Second Midterm

(do not write here)

Name:

GSI:

Section number:

or time and room:

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Please show all your work and exhibit your final answers clearly. You may use the backs of these pages for your extra work. You have 50 minutes.

*Problem 1* (20 points)

A company makes a product. It costs 10 dollars to make one item. If it charges 30 dollars per item it will sell exactly 1,000 items; but if it charges 20 per item it will sell exactly 2,000 items. Assuming a linear demand function, how many items should the company make to maximize its profit.

*Problem 2* (20 points)

$f(x)$  is a function whose derivative is  $\sqrt{x^2 + 1}$ . What is the derivative of  $f(3x + 2)$ .

*Problem 3* (20 points)

$y$  and  $z$  are functions of  $x$  with the property  $z^3y^5 + z^5y^7 = 2$ . Also, when  $x = 3$  we have  $y = 1$  and  $z = 1$ . Also, when  $x = 3$ , we have  $\frac{dy}{dx} = 5$ . Find  $\frac{dz}{dx}$  when  $x = 3$ .

*Problem 4* (20 points)

Solve for  $x$ . (your answers can involve  $e$  and/or  $\ln$ )

(a) (10 points)  $e^{(3x+2)} = 5$

(b) (10 points)  $\ln(3x^2) = 5$

*Problem 5* (20 points)

Find the derivative of  $(x^2 + 1)^x$