

**MA 125-CW, CALCULUS I**

Test 4, April 14, 2016

Name (Print last name first): .....

<b>Show all your work and justify your answer!</b>
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<b>No partial credit will be given for the answer only!</b>
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<b>PART I</b>
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**You must simplify your answer when possible.****All problems in Part I are 9 points each.**1. If  $f(x) = \ln(x^3 + x^2)$ , find the derivative  $f'(x)$ .2. Find the derivative of  $f(x) = e^{5x+1}$ .

3. Evaluate  $\int xe^{x^2} dx$

4. Solve  $e^{2x+5} = 2$ .

5. Solve  $\ln(2x - 1) = -1$ .

6. Use Newton's method to approximate the value of  $\sqrt{36.3}$ . Start with  $x_1 = 6$  and only compute the second approximate value  $x_2$ . Hint: solve  $x^2 - 36.3 = 0$ .
7. Given  $f(x) = x^3 + 4x + 1$  show first that  $f(x)$  is one-to-one and next compute the derivative  $(f^{-1})'(4)$

**PART II**

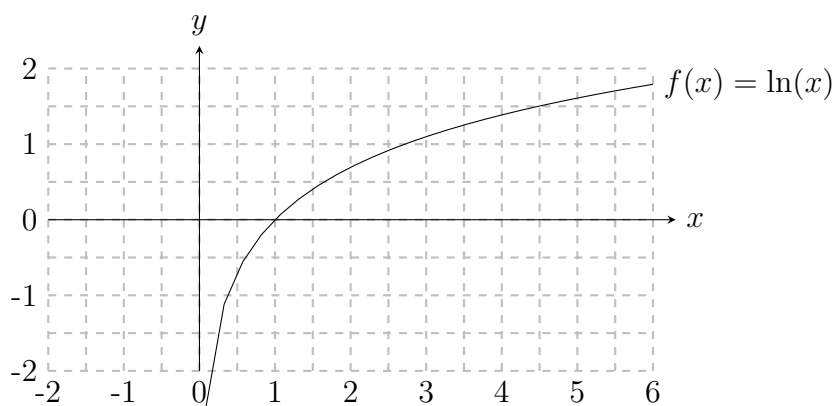
1. [10 points] Evaluate

$\int_{1/2}^2 \frac{1}{x} dx$ . Show your work and do NOT give a decimal number as your answer (i.e., give an expression involving an appropriate function as your answer).

2. [12 points] Given the graph of  $y = \ln(x)$  below read off:

- (1) the value  $y = \ln(1.5)$
- (2) the value of  $x = e^{0.5}$  (Hint: recall that  $\ln(x)$  and  $e^x$  are inverse functions!)
- (3) Estimate the derivative of  $e^x$  at  $x = 0.5$  (Hint: draw the appropriate tangent line and estimate its slope).

Indicate in the graph how you found your values; do NOT use your calculator to find these values!



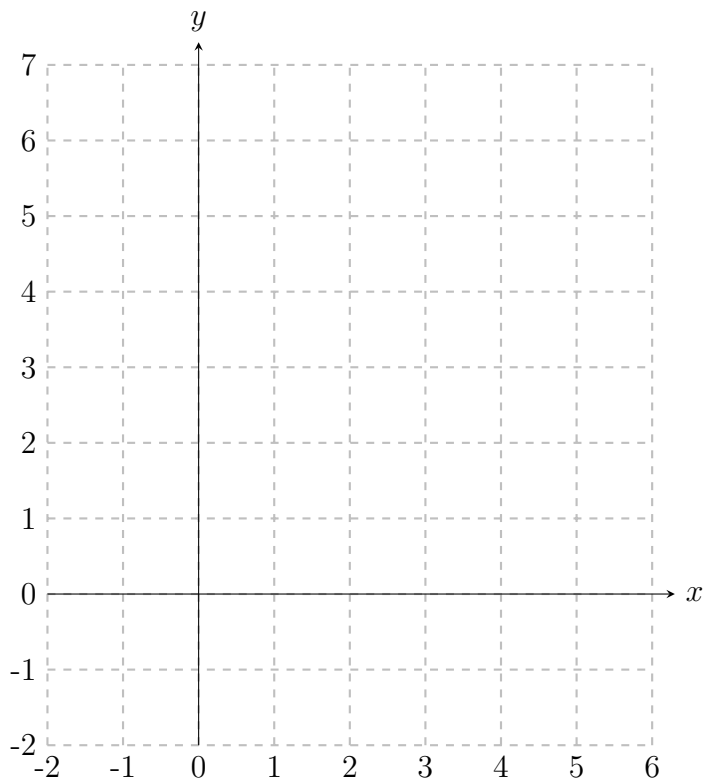
3. [15 points] Graph the function  $f(x) = x \ln(x)$  for  $x > 0$ . Indicate in the graph:

(a)  $x$ - and  $y$ -intercepts (if any)

(b) Horizontal and Vertical asymptotes (if any). [Do  $\lim_{x \rightarrow 0^+} x \ln(x)$  numerically by computing values at  $x = \frac{1}{10}$  and  $x = \frac{1}{100}$ .]

(c) Find critical points and where  $f(x)$  is increasing/decreasing.

(d) Local/Absolute Max/Min of  $f(x)$ , if any.



Scratch paper