

MA 125 CT, CALCULUS I

Test 4, April 14, 2016

Name (Print last name first):

Show all your work and justify your answer!

No partial credit will be given for the answer only!
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PART I

You must simplify your answer when possible.

All problems in Part I are 9 points each.

1. If $f(x) = \ln(x^3 + x)$, find the derivative $f'(x)$.

2. Find the derivative of $f(x) = e^{4x+1}$.

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

4. Solve $e^{2x+3} = 2$.

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

6. Use Newton's method to approximate the value of $\sqrt{25.3}$. Start with $x_1 = 5$ and only compute the second approximate value x_2 . Hint: solve $x^2 - 25.3 = 0$.
7. Given $f(x) = x^3 + 2x + 1$ 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 \ln as your answer).

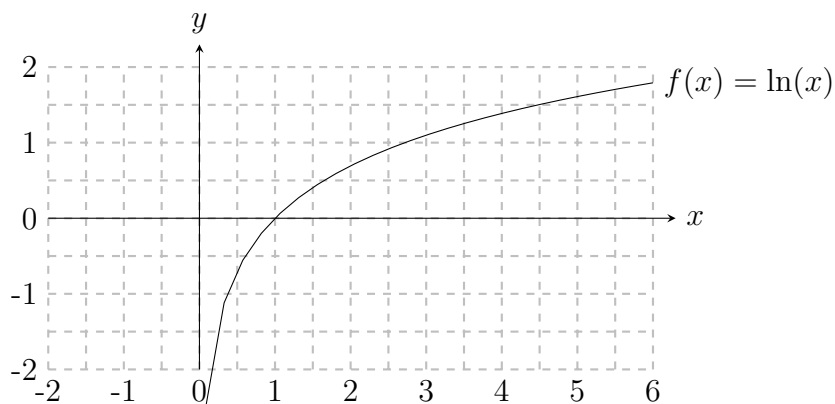
2. [12 points] Given the graph of $y = \ln(x)$ below read off:

(1) the value $y = \ln(3)$

(2) the value of $x = e^{0.5}$ (Hint: recall that $\ln(x)$ and e^x are inverse functions so that if $f(x) = \ln(x)$, then $e^{0.5} = f^{-1}(0.5)$)

(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!



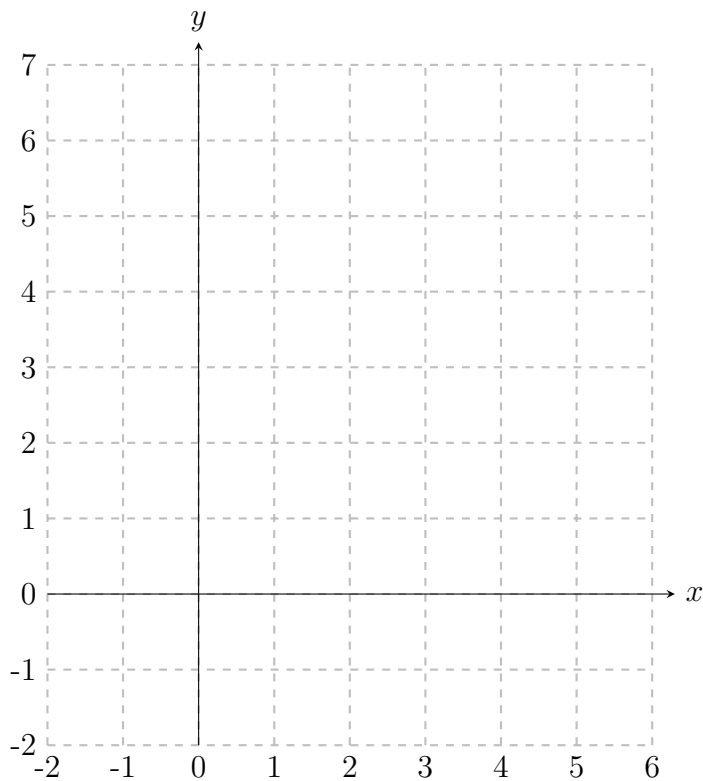
3. [15 points] Graph the function $f(x) = x \ln(x)$ for $x > 0$. Indicate in the graph:

(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