

Math 221 Section EL1 Exam II

UIUC, October 28, 2014

Name Solutions - Version C

WF Discussion Section (circle yours)

9:00-9:50 (EDA) Benjamin Wright	11:00-11:50 (EDB) Michael Livesay	12:00-12:50 (EDC) Seth Wolbert
1:00-1:50 (EDD) Seth Wolbert	2:00-2:50 (EDE) Matej Penciak	3:00-3:50 (EDF) Benjamin Wright
10:00-10:50 (EDG) Michael Livesay	9:00-10:50 (ED1) Aristotelis Panagiotopoulos	1:00-2:50 (ED2) Colleen Ackermann

Read all of the following information before starting the exam:

- Show all work, clearly and in order, if you want to get full credit. The graders reserve the right to take off points if they cannot see how you arrived at your answer (even if your final answer is correct).
- Calculators, notes, phones, and other aids including all electronic devices, are not permitted!
- This test has 9 problems, 10 pages, and is worth 80 points. It is your responsibility to make sure that you have all of the pages!
- There is a (small) formula sheet on the last page.
- Good luck!

Problem	Grade
1. (/10)	
2. (/5)	
3. (/5)	
4. (/10)	
5. (/10)	
6. (/10)	
7. (/10)	
8. (/10)	
9. (/10)	
Total: (/80)	

C

1. (10 points) Use implicit differentiation to find the derivative of $f(x) = \operatorname{arccsc}(x)$.

$$y = \operatorname{arccsc} x$$

$$\Rightarrow \csc y = x$$

$$\Rightarrow -\csc y \cot y \frac{dy}{dx} = 1$$

$$\Rightarrow \frac{dy}{dx} = -\sin y \tan y$$

$$= -\frac{1}{x} \frac{1}{\sqrt{x^2-1}}$$



2. (5 points) A radioactive material has a half-life of 600 years. What fraction of the original material is left after 6 years? (Do not express your answer using decimals; calculators are forbidden for this test.)

$$A(600) = \frac{A_0}{2} = A_0 e^{k \cdot 600} \Rightarrow \frac{\ln \frac{1}{2}}{600} = k$$

$$A(6) = A_0 e^{(\ln \frac{1}{2}) \frac{6}{600}} \Rightarrow \frac{A(6)}{A_0} = \frac{1}{2}^{1/100}$$

3. (5 points) Use a linear approximation to approximate $\arcsin(\sqrt{2} - \frac{1}{10})$.

$$L(x) = \arcsin(a) + \frac{1}{a\sqrt{a^2-1}}(x-a)$$

Let $a = \sqrt{2}$, $\arcsin(a) = \frac{\pi}{4}$. So,

$$L(\sqrt{2} - \frac{1}{10}) = \frac{\pi}{4} + \frac{1}{\sqrt{2} \cdot 1} \left(\frac{1}{10} \right)$$