

Math 31B
Integration and Infinite Series

Practice Midterm 1

Instructions: You have 50 minutes to complete this exam. There are 8 questions, worth a total of 10 points. This test is closed book and closed notes. No calculator is allowed. Please write your solutions on the scantron. Do not forget to write your name, section, and UID in the space below, as well as in your scantron.

Name: _____

ID number: _____

Section: _____

Question	Points	Score
1	1	
2	1	
3	2	
4	1	
5	1	
6	1	
7	1	
8	2	
Total:	10	

Problem 1. *1pts.*
7.1.53

Solution: The critical point is $x = 1$. It has a point of inflection at $x = 2$, the function is concave down for $x < 2$ and concave up for $x > 2$.

Problem 2. *1pts.*
7.2.35

Solution: The inverse and its derivative take values $f^{-1}(4) = 2$ and $(f^{-1})'(4) = \frac{4}{5}$.

Problem 3. *2pts.*
7.3.71

Solution: The differential is $f'(x) = \frac{1}{2} \sqrt{\frac{x(x+2)}{(2x+1)(2x+2)}} \left(\frac{1}{x} + \frac{1}{x+2} - \frac{2}{2x+1} - \frac{1}{x+1} \right)$.

Problem 4. *1pts.*

7.7.61

Solution: Computing $\lim_{n \rightarrow \infty} \frac{e^{\sqrt{\ln(x)}}}{\sqrt{x}} = \lim_{u \rightarrow \infty} e^{\sqrt{u}} - \frac{u}{2} = 0$ so $e^{\sqrt{\ln(x)}} \ll \sqrt{x}$.

Problem 5. *1pts.*

7.8.83

Solution: The integral is $\int \frac{(3x+2)dx}{x^2+4} = \frac{3}{2} \ln(x^2 + 4) + \arctan\left(\frac{x}{2}\right) + C$.

Problem 6. *1pts.*
7.9.55

Solution: The integral is $\int \frac{dx}{\sqrt{9+x^2}} = \arcsin\left(\frac{x}{3}\right) + C$.

Problem 7. *1pts.*

11.1.47

Solution: The integral is $\int \frac{\ln(\ln(x)) \ln(x) dx}{x} = \frac{1}{4}(\ln(x))^2(2 \ln(\ln(x)) - 1) + C$.

Problem 8. *2pts.*
8.5.27

Solution: The integral is $\int \frac{dx}{x(x-1)^3} = -\ln|x| + \ln|x-1| + \frac{1}{x-1} - \frac{1}{2(x-1)^2} + C$.