
Math 109, Fall 2018
Midterm 2

Name:

Section:

Requirements:

- This exam should be completed in **45 minutes**.
 - Books, notes, calculators, computers, discussion and collaboration are not allowed.
 - Do all of your work in this exam booklet.
 - Simplify all answers as far as possible.
 - Solutions without proper justification will receive no credit.
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Problem	Points	Score
1	15	
2	15	
3	20	
4	20	
5	10	
6	20	
Total	100	

Problem 1. (15') Find the area of the region that is bounded by the polar curve $r = \sin \theta$ and lies in the sector $\frac{\pi}{6} \leq \theta \leq \frac{\pi}{3}$.

Problem 2. (15') Determine whether the following improper integral converges or diverges. If it converges, compute it.

$$\int_0^1 \frac{1}{x^2 - 4x + 3} dx.$$

Problem 3. (20') Determine whether the following improper integral converges or diverges. Explain it.

a) $\int_1^{10} \frac{1}{\sqrt[5]{x-3}} dx.$

b) $\int_{10}^{\infty} \frac{1}{x^2-4} dx.$

Problem 4. (20') Determine whether the following sequence $\{a_n\}_{n=1}^{\infty}$ converges or diverges. If it converges, compute the limit.

a) $a_n = \frac{\ln(n^2 + 2)}{\ln(3n)}$.

$$\text{b) } a_n = \frac{(-1)^n}{2\sqrt{n}}.$$

Problem 5. (10') Determine whether the series $\sum_{n=1}^{\infty} \cos \frac{1}{n^3}$ converges or diverges. Explain it.

Problem 6. (20') Determine whether the series converges or diverges.
If it converges, compute it.

a)
$$\sum_{n=0}^{\infty} \frac{2}{5^{n+1}}$$

$$\text{b) } \sum_{n=0}^{\infty} \left(\frac{3}{2}\right)^n$$