

MATH 116 — PRACTICE FOR EXAM 2

Generated October 8, 2018

NAME: _____

INSTRUCTOR: _____ SECTION NUMBER: _____

1. This exam has 8 questions. Note that the problems are not of equal difficulty, so you may want to skip over and return to a problem on which you are stuck.
2. Do not separate the pages of the exam. If any pages do become separated, write your name on them and point them out to your instructor when you hand in the exam.
3. Please read the instructions for each individual exercise carefully. One of the skills being tested on this exam is your ability to interpret questions, so instructors will not answer questions about exam problems during the exam.
4. Show an appropriate amount of work (including appropriate explanation) for each exercise so that the graders can see not only the answer but also how you obtained it. Include units in your answers where appropriate.
5. You may use any calculator except a TI-92 (or other calculator with a full alphanumeric keypad). However, you must show work for any calculation which we have learned how to do in this course. You are also allowed two sides of a 3" x 5" note card.
6. If you use graphs or tables to obtain an answer, be certain to include an explanation and sketch of the graph, and to write out the entries of the table that you use.
7. You must use the methods learned in this course to solve all problems.

Semester	Exam	Problem	Name	Points	Score
Fall 2015	2	6		9 18	
Winter 2014	2	11		5 10	
Winter 2015	2	9		5 10	
Fall 2015	2	1		12	
Fall 2014	2	5		10	
Winter 2018	3	4		5 15	
Winter 2016	2	1		7 14	
Fall 2016	2	11		6 12	
Total				59 94	

Recommended time (based on points): ~~88~~ minutes

55

6. [15 points] For each of the following questions, fill in the blank with the letter corresponding to the answer from the bottom of the page that correctly completes the sentence. No credit will be given for unclear answers. You do not need to show your work.

a. [3 points] The limit, $\lim_{x \rightarrow \infty} \left(\frac{x+2}{x} \right)^{x/2}$, ...

b. [3 points] The value of the integral $\int_{-1}^1 \frac{e}{x^{1/3}} dx$...

c. [3 points] The value of the integral $\int_{-1}^2 \frac{8e}{x^3} dx$...

d. [3 points] The value of A for which the differential equation $y'' = Ay$ is satisfied by the function $f(t) = e^{At}$...

e. [3 points] The length of the polar curve $r = \frac{4e}{\pi} \cos(\theta)$ between $\theta = -\pi/4$ and $\theta = \pi/4$...

(A)...is $e^{1/2}$.

(F)...is 1.

(B)...is e .

(G)...is 0.

(C)...is e^2 .

(H)...is 2.

(D) ...is $2e$.

(I)...does not exist.

(E)...is $3e$.

(J)...diverges.

11. [10 points]

a. [5 points] Compute the improper integral $\int_0^1 \ln(x) dx$. Show your work.

b. [5 points] Use comparison of improper integrals to determine if the improper integral $\int_1^{\infty} \frac{\sin(x) + 3}{x^2 + 2}$ converges or diverges. Show your work.

9. [10 points] Determine if the following integrals converge or diverge. If the integral converges, circle the word “converges” and give the **exact value** (i.e. no decimal approximations). If the integral diverges, circle “diverges”. In either case, **you must show all your work and indicate any theorems you use**. Any direct evaluation of integrals must be done **without using a calculator**.

a. [5 points] $\int_0^1 \ln(x) dx$

CONVERGES

DIVERGES

b. [5 points] $\int_2^{\infty} \frac{x + \sin x}{x^2 - x} dx$

CONVERGES

DIVERGES

1. [12 points] Determine if the following integrals converge or diverge. If the integral converges, circle the word “converges” and give the **exact value** (i.e. no decimal approximations). If the integral diverges, circle “diverges”. In either case, **you must show all your work and indicate any theorems you use**. Any direct evaluation of integrals must be done **without using a calculator**.

a. [6 points] $\int_0^1 \frac{e^x \sin(2x) - (2e^x - 2) \cos(2x)}{\sin^2(2x)} dx$

(Note: $\frac{d}{dx} \left(\frac{e^x - 1}{\sin(2x)} \right) = \frac{e^x \sin(2x) - (2e^x - 2) \cos(2x)}{\sin^2(2x)}$)

Converges

Diverges

b. [6 points] $\int_2^\infty \frac{1}{(\ln x)^2 x} dx$

Converges

Diverges

5. [10 points] Determine whether the following integrals converge or diverge. If the integral converges, find the exact value. You must show all work, and perform any integral computations by hand.

a. [5 points] $\int_2^{\infty} \frac{dx}{x(\ln(x))^2}$

b. [5 points] $\int_1^3 \frac{x}{(x-3)^3} dx$

4. [11 points]

- a. [6 points] Determine whether the following series converges absolutely, converges conditionally, or diverges, and give a complete argument justifying your answer.

$$\sum_{n=1}^{\infty} (-1)^n \sin\left(\frac{1}{n}\right)$$

Converges absolutely

Converges conditionally

Diverges

Justification:

- b. [5 points] Compute the value of the following improper integral. Show all your work using correct notation. Evaluation of integrals must be done without a calculator.

$$\int_0^{\infty} \frac{e^x}{(1+e^x)^2} dx$$

1. [14 points] Determine if the following integrals converge or diverge. If the integral converges, circle the word “converges” and give the exact value (i.e. no decimal approximations). If the integral diverges, circle “diverges”. In either case, you must give full evidence supporting your answer, showing all your work and indicating any theorems about improper integrals you use. Any direct evaluation of integrals must be done without using a calculator.

a. [7 points] $\int_1^{\infty} \frac{x}{e^{ax^2+1}} dx$, where $a > 0$ is a constant

Converges

Diverges

b. [7 points] $\int_2^{\infty} \frac{x + \sin x}{x^2} dx$

Converges

Diverges

11. [12 points] Determine whether the following integrals converge or diverge. If an integral converges, find its exact value (i.e., no decimal approximations) and write it in the blank provided. If it diverges, circle "DIVERGES" and explain why. In any case, show all your work, indicating any theorems you use, and using proper syntax and notation.

a. [6 points] $\int_0^{\infty} 2xe^{-cx} dx$, where $c > 0$ is a constant

DIVERGES

CONVERGES TO _____

b. [6 points] $\int_0^y \frac{x}{\sqrt{x^5 + x^7}} dx$

DIVERGES

CONVERGES TO _____