Math 121 Midterm Exam #2 October 15-19, 2020

Due Monday, October 19, in Gradescope by 11:59 pm EDT

• This is an *Open Notes* Exam. You can use materials, homeworks problems, lecture notes, etc. that you manually worked on.

• There is **NO** *Open Internet* allowed. You can only access our Main Course Webpage.

• You are not allowed to work on or discuss these problems with anyone. You can ask a few small, clarifying, questions about instructions in Office Hours, but these problems will not be solved.

• Submit your final work in Gradescope in the Exam 2 entry.

• Please *show* all of your work and *justify* all of your answers.

1. [40 Points] Compute the following integrals. Simplify all answers. Justify your work.

(a) $\displaystyle\int \frac{11-x}{x^2-4x+5}\,dx$ (b) $\displaystyle\int_{-2}^{-1} \frac{11-x}{x^2-4x-5}\,dx$ (c) $\displaystyle\int_{-\infty}^{7} \frac{1}{x^2-4x+29}\,dx$

(d) $\displaystyle\int_0^1 x^5 \ln x\,dx$

2. [14 Points] Demonstrate **two different** methods to prove this given series $\displaystyle\sum_{n=1}^{\infty} \frac{n}{e^{2n}}$ Converges.

1. First you must use the Integral Test.

2. Second, use a different method.

3. [21 Points] Determine whether each of the following series **converges** or **diverges**. Name any convergence test(s) you use, and justify all of your work.

(a) $\displaystyle\sum_{n=1}^{\infty} \frac{7}{n^9} + \frac{7^n}{9^n}$ (b) $\displaystyle\sum_{n=2}^{\infty} \frac{n^9}{7\ln n}$

(c) Use the Absolute Convergence Test to Prove that $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{n^9+7^n}$ is convergent.

4. [25 Points] Determine whether each of the given series is **absolutely convergent**, **conditionally convergent**, or **divergent**. Name any convergence test(s) you use, and justify all of your work.

(a) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{9n-7}$ (b) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n\ 3^n\ n!\ n^n}{n^3\ (2n)!}$ (c) $\displaystyle\sum_{n=1}^{\infty} (-1)^{n+1}\ \frac{n^7+9}{n^9+7}$