

Math 121 Midterm Exam #2, Sample Exam 2

This is a modified version of Midterm 2 from Spring 2015.

1. Compute the following integral, or determine that it diverges.

(a) $\int \frac{x+7}{x^3+7x} dx$

(b) $\int_2^\infty \frac{1}{x \ln x} dx$

(c) $\int_8^\infty \frac{1}{x^2 - 10x + 28} dx$

2.

(a) Determine **and state** whether the following *sequence* **converges** or **diverges**. If it converges, compute its limit. Justify your answer. Do **not** just put down a number.

$$\left\{ \frac{\sqrt{2n^4 + 5n^3 + 7}}{1 + 5n^2} \right\}_{n=1}^\infty$$

(b) Determine **and state** whether the following *series* **converges** or **diverges**. Justify your answer.

$$\sum_{n=1}^\infty \frac{\sqrt{2n^4 + 5n^3 + 7}}{1 + 5n^2}$$

3. Find the **sum** of the following series (which does converge).

$$\sum_{n=1}^\infty (-1)^n \frac{5^{n+1}}{3^{2n-1}}$$

4. Use the **Integral Test** to **determine** and **state** whether the series $\sum_{n=1}^\infty \frac{n}{e^{3n}}$ converges or diverges. Justify all of your work.

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

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

(b)
$$\sum_{n=1}^{\infty} \left(\frac{3}{n^3} + \frac{\sin^2(3n)}{3^n} \right)$$

6. In each case determine whether the given series is **absolutely convergent**, **conditionally convergent**, or **diverges**. Name any convergence test(s) you use, and justify all of your work.

(a)
$$\sum_{n=1}^{\infty} (-1)^n \frac{n^2 + 7}{n^7 + 2}$$

(b)
$$\sum_{n=1}^{\infty} \frac{(-3)^{n(n!)^2}}{(2n)!}$$

(c)
$$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{1}{\sqrt{n} + 4}$$