

# Calculus II Week7 HW-extraQuestions

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补充习题集第十三章：第1题

Midterm 2021：选择题 一、(2),(3),(5)填空题 二、(1),(2),(3),(4)

第七题、第八题、第九题。

1. Find the osculating circle of  $y = x^3$  at  $x = 1$ .

- 1. Multiple Choice Questions:

(only one correct answer for each of the following questions.)

(2) Let  $a_n > 0$  for all  $n$ . Which of the following statements must be true?

(A) If  $\lim_{n \rightarrow \infty} a_n = 0$ , then the series  $\sum_{n=1}^{\infty} a_n$  converges.

(B) If  $\lim_{n \rightarrow \infty} a_n = l$  and  $l \neq 0$ , then the series  $\sum_{n=1}^{\infty} a_n$  converges.

(C) If  $\lim_{n \rightarrow \infty} a_n = l$  and  $l \neq 0$ , then the series  $\sum_{n=1}^{\infty} a_n$  diverges.

(D) None of the above statements is correct.

(3) Identify the surface of  $2x^2 + y^2 = z^2$ .

- (A) Hyperboloid of two sheets.
- (B) Elliptical Cone.
- (C) Hyperboloid of one sheet.
- (D) Elliptical paraboloid.

(5)  $\lim_{(x,y) \rightarrow (0,0)} (1 + xy)^{\frac{1}{x^2+y^2}} =$

(A) 0 (B) 1 (C) e (D) Does not exist

- 2.Fill in the blanks

(1) If  $\mathbf{a}$ ,  $\mathbf{b}$ ,  $\mathbf{c}$  are unit vectors and  $\mathbf{a} + \mathbf{b} + \mathbf{c} = \mathbf{0}$ , then

$$\mathbf{a} \cdot \mathbf{b} + \mathbf{b} \cdot \mathbf{c} + \mathbf{c} \cdot \mathbf{a} =$$

(2) If the vector  $\mathbf{c}$  is perpendicular to  $\mathbf{a} = (1, 2, 1)$  and  $\mathbf{b} = (-1, 1, 1)$  and  $\mathbf{c} \cdot (i - 2j + k) = 16$ , then  $\mathbf{c} =$

(3) If  $\sum_{n=2}^{\infty} \left( \tan \frac{1}{n} - k \ln \left( 1 - \frac{1}{n} \right) \right)$  converges, then  $k =$

(4) The maximum curvature  $k$  of the function  $y(x) = \sin(x)$  is

- 7.(10 pts)

For the power series  $f(x) = \sum_{n=1}^{\infty} \frac{n+2}{n(n+1)} x^n$ , where  $p > 0$ .

- (1) For what values of  $p$  does the power series converge?
- (2) Find the sum of the series within the interval of convergence.

- 8.(10 pts)

Determine if the series  $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^p (\ln n)^2}$  ( $p > 0$ ), where  $p > 0$ , converges absolutely, or converges conditionally, or diverges. Give reasons for your answer.

- 9.(10 pts)

$$\lim_{n \rightarrow \infty} \left( (n^2 - n)e^{\frac{1}{n}} - \sqrt{n^4 + 1} \right)$$



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