



Team: \_\_\_\_\_

Moda  
MAA4226 MAA5228

Home-B

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Touch: 6May2016

**Hello.** Our take-home slid completely under my office door.  
by 4PM of **Tuesday, 23Nov2010**. Please write **DNE**  
in a blank if the described object does not exist or if the indi-  
cated operation cannot be performed.

**B1:** Show no work. Fill-in *all* blanks on this sheet! (*Handwriting is fine; don't bother to type*).

**a** For natural number  $K$ , the sum

$$\sum_{n=3}^{3+K} 4^n \text{ equals } \underline{\hspace{2cm}}.$$

**b**  $\sum_{n=1}^{\infty} r^n = \frac{5}{8}$ . So  $r = \underline{\hspace{2cm}}$  or **DNE**.

[Hint: The sum starts with  $n$  at **one**, not zero.]

**c**  $\sum_{n=3}^{\infty} \left[ \frac{1+2i}{3} \right]^n = \underline{\hspace{2cm}} + \left[ i \cdot \underline{\hspace{2cm}} \right].$

**d** The Mac of  $\frac{5}{1-x^3}$  has RoC =  $\underline{\hspace{2cm}}$ .

Mac(x) =  $\underline{\hspace{2cm}}$ .

Write the first 5 non-zero terms,

$$\text{e.g. } 8x^3 + \frac{1}{8}x^6 + \frac{3}{2}x^8 - x^{12} - 7x^{15} + \dots$$

**e** Writing poly  $p(x) := 5 - 3x + 77x^2 + 9x^3 + 5x^4$  as  $\sum_{k=0}^4 C_k \cdot [x-1]^k$ , coeff  $C_3$  is in: Circle *one* interval  
( $-\infty, -70$ ), [ $-70, -15$ ), [ $-15, -8$ ), [ $-8, -1$ ), [ $-1, 8$ ),  
[ $8, 15$ ), [ $15, 30$ ), [ $30, 75$ ), [ $75, 94$ ), [ $94, +\infty$ ).

*Essay questions: For each question, carefully type a triple-spaced essay solving the problem.*

**B2:** A fnc  $f \in \text{Diff}^2(\mathbb{R} \rightarrow \mathbb{R})$  with  $f(7) = 0$  and  $f'(7) = 0$ , satisfies

$$\dagger: \quad f'' + f = \mathbf{0}. \quad [\text{I.e., the zero-fnc.}]$$

Prove that  $f = \mathbf{0}$ , using Taylor's thm, as follows:

First, show that  $f \in \mathbf{C}^\infty$ . Then, for a fixed  $x_0 \in \mathbb{R}$ , argue that  $|f(x_0)|$  is as small as desired, by upper-bounding with Taylor-remainder terms from **Our Taylor's pamphlet** on the Teaching Page.

[Hint: Use TAYTHM-2 on page 2 of the pamphlet.]

End of Home-B

**B1:** \_\_\_\_\_ 125pts

**B2:** \_\_\_\_\_ 85pts

Poorly stapled, or  
missing ordinals : \_\_\_\_\_ -5pts

Missing names, or  
honor sigs : \_\_\_\_\_ -5pts

**Total:** \_\_\_\_\_ 210pts

**HONOR CODE:** "I have neither requested nor received help on this exam other than from my team-mates and my professor (or his colleague)." Name/Signature/Ord

Ord: \_\_\_\_\_

Ord: \_\_\_\_\_

Ord: \_\_\_\_\_