## MAT137 - Term 2, week 9, lecture 3

- **Reminder:** Test 4 is next week. It will cover up to the end of this week's lecture material (i.e., up to all but the last two videos on Playlist 13).
- Today's lecture will assume you have watched up to and including video 13.17.

For next Tuesday's lecture, watch all remaining videos on Playlist 13.

• Turns out that there won't be a next lecture, because the university has cancelled in-person lectures. I hope you had a good term-and-a-half with me this year in MAT137, and I hope to see some of you online!

# Quick warm-up – Alternating series





Try to construct a series of the form  $\sum_{n=1}^{\infty} (-1)^n b_n$  such that

• 
$$b_n > 0$$
 for all  $n \ge 1$ ,

00

• 
$$\lim_{n\to\infty} b_n = 0$$
,

• the series 
$$\sum_{n=1}^{\infty} (-1)^n b_n$$
 is divergent.

*Hint:* First, think about which hypothesis of the Alternating Series Test must fail in order for this to be possible.

## True or False – Absolute Values

• IF  $\{a_n\}_{n=1}^{\infty}$  is convergent, THEN  $\{|a_n|\}_{n=1}^{\infty}$  is convergent.

**2** IF  $\{|a_n|\}_{n=1}^{\infty}$  is convergent, THEN  $\{a_n\}_{n=1}^{\infty}$  is convergent.

**3** IF 
$$\sum_{n=1}^{\infty} a_n$$
 is convergent,  
THEN  $\sum_{n=1}^{\infty} |a_n|$  is convergent.

**4** IF 
$$\sum_{n=1}^{\infty} |a_n|$$
 is convergent,  
THEN  $\sum_{n=1}^{\infty} a_n$  is convergent.

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#### Positive and negative terms – part 1

- Let  $\sum a_n$  be a series.
- Call  $\sum$  P.T. the sum of only the positive terms of the same series.
- Call  $\sum N.T.$  the sum of only the negative terms of the same series.

$IF \sum P.T. \ is$	AND $\sum N.T.$ is	THEN $\sum a_n$ may be
CONV	CONV	
$\infty$	CONV	
CONV	$-\infty$	
$\infty$	$-\infty$	

#### Positive and negative terms – part 2

- Let  $\sum a_n$  be a series.
- Call  $\sum$  P.T. the sum of only the positive terms of the same series.
- Call  $\sum N.T.$  the sum of only the negative terms of the same series.

	$\sum$ P.T. may be	$\sum N.T.$ may be
If $\sum a_n$ is CONV		
If $\sum  a_n $ is CONV		
If $\sum a_n$ is ABS CONV		
If $\sum a_n$ is COND CONV		
If $\sum a_n = \infty$		
If $\sum a_n$ is DIV (oscillating)		