

The University of Western Ontario (Western University)

**Calculus 1501B, Winter 2014**  
**Homework assignment 2**

*Due on Tuesday Feb. 25, in class.*

*Each problem is worth 4 marks (20 marks total).*

**Problem 1.** Find the positive integer  $n$  such that  $\Gamma(n^2 - 4) = 24$ . An explanation must be provided.

**Problem 2.** Use the  $\varepsilon$ - $\delta$  definition of a convergent sequence to prove that the sequence

$$a_n = \frac{3n^2}{n^2 + 1}$$

converges.

**Problem 3.** Which sequences, among the following, converge ? (include a brief explanation for each)

$$a_n = \frac{2^{n+2}}{\pi^n}$$

$$b_n = \frac{(-1)^n}{n}$$

$$c_n = \ln(n^2 + 3) - \ln n$$

$$d_n = \cos(e^{1/n})$$

**Problem 4.** Use the  $\varepsilon$ - $\delta$  definition of a convergent sequence to prove that the series

$$s = \sum_{k=1}^{\infty} (-1)^k$$

diverges.

**Problem 5.** Which series, among the following, converge ? (include a brief explanation for each)

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

$$\sum_{k=1}^{\infty} (1.2)^k$$

$$\sum_{k=1}^{\infty} \frac{k(k^2 + 2)}{(k+1)(k+2)(k+3)}$$

$$\sum_{n=1}^{\infty} \frac{1}{n+1}$$