Math 1 - Homework #11

October 9, 2019

This homework should be turned in at the boxes outside 108 Kemeny Hall by **4:00pm on Wednesday, October 16th**. Unless otherwise stated, all problems can be found in the course textbook.

1 Practice Problems (Optional)

Feel free to do these problems for your own practice. They are not graded, and you don't need to turn them in.

1. Determine whether the following sequences are increasing, decreasing, or not monotonic, and explain. Is the sequence bounded? If yes, what is it bounded by?

   (a) $a_n = \cos(\pi n)$

   (b) $a_n = \frac{1}{2n+3}$

   (c) $a_n = (-1)^n n$

   (d) $a_n = (-3)^n$

2. Use the Monotone Convergence Theorem to show that each sequence converges.

   (a) $a_n = \frac{2}{3n}$

   (b) $a_n = (\frac{1}{\pi})^n$

   (c) $a_n = 5 - \frac{2}{n}$

3. Give an example of a sequence that is monotone but not convergent.

2 Assigned Problems (Required)

These problems should be turned in and will be graded.

1. Determine whether the following sequences are increasing, decreasing, or not monotonic, and explain. Is the sequence bounded? If yes, what is it bounded by?

   (a) $a_n = \sin(n)$

   (b) $a_n = \frac{1}{n^2+1}$

   (c) $a_n = \frac{1-n}{2+n}$

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

2. Use the Monotone Convergence Theorem to show that each sequence converges.

   (a) $a_n = -(\frac{2}{3})^n$

   (b) $a_n = 1 + \frac{1}{n}$

   (c) $a_n = \frac{2}{(-n)^2}$

3. Give an example of a sequence that is bounded but not convergent.

4. Give an example of a sequence that is not monotone but is convergent.