Question 1 rubric

Before contacting the instructor about your score, please REVIEW the RUBRIC CAREFULLY. You will plobably understand why points were taken off. If you have any concerns, please contact the instructor who graded this question for all students (see contact information at the end of the rubric).

A correct solution should have the following elements, with partial credit given as follows:
Correct answer: "No, it does not always converge" or "it can diverge": 2pts
A plot is included, showing a sequence going to $-\infty$: 6pts
The plot is accompanied with
- EITHER an explicit formula (like $a_n = -n$ or $x_n = -n^2$) OR some explanation/statement for divergence to -infinity (like saying that sequence "decreases indefinitely and goes to $infty$", or similar words to that effect)
- AND some evidence of an upper bound (explicit number/statement, or simply a horizontal line drawn above the sequence)

Note: no formula was required if there's sufficient graphical explanation/some words, and no work was needed to show upper bound+decreasing for "obvious" sequences.
Correct answer with explanation but no plot: 9pt
Partial credit: 1 pt for answer "No"; 1pt for statements "increasing sequence, bounded above: converges" and/or "decreasing, bounded below: converges"
Points were taken off for the following mistakes:
statements "it diverges" or "it does not converge" (in the situation described in the question, convergence is *possible* but not guaranteed): -0.5pt
no distinction between a function and a sequence: all work is done for a function, -3pts; work done for a sequence but graph of function is given, -1pt.

Question 3 was graded by Hugo Mainguy, hugo.mainguy@stonybrook.edu. He can be contacted with any concerns about your score for this question.

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Question 2 Rubric:
        (a) 3pts
        (b) 2pts
        (c) 2pts
        (d) 3pts

        (a)     Correct, full solution:
                                Divide top and bottom by n^2
                                Use limit laws
                                Compute the limit of each term on top and bottom
                                Correct result
                                        or
                                Used L'Hopital's Rule several times with justification

                        Wrong Result Skipped Steps 0pt
                                Found the sequence to diverge, no steps
                        Skipped Steps .5pt
                                Wrote answer without any/valid justification
                        Skipped Steps 1pt
                                Cited ratio of highest powers as answer
                        Skipped Steps 1.5pt
                                Clearly explained insignificance of lower order terms in the l
imit
                                Did not divide top and bottom by n^2
                                Did not cite limit laws
                                        or
                                Used L'Hopital's Rule without justification
                        Skipped Steps 2pt
                                Clearly explained insignifiance of lower order terms in the li
mit
                                Did not divide top and bottom by n^2
                                Used limit laws in explanation
                        Falsely Declare Divergence 2pt
                                Correct Process and calculation of limit
                                Declare result to diverge anyway
                        Skipped Steps 2.5pt
                                Correct process, but did not mention or explicitly use limit l
aws
                                Correct result
                        Correct Process, Computation Error 2.5pt
                                Made a computational error, process otherwise ok
                                        or
                                Correct process, significant notation problems leading to fals
e equations

        (b)             Correct, full solution:
                                Explain relationship between limit of partial sums and sum of
series
                                Same result as previous step

                        Did not realize that S_n is the partial sum of the series 0pt
                                Tries to compute the sum of the series of S_n from the previou
s part
                        Recalculates Result 1pt
                                Gets result by repeating calculation of previous part
                        No explanation 1.5pt
                                Gives correct answer, no explanation at all
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        (c)             Correct, full solution:
                                Writes equations for S_1 and S_2 as partial sums of series ele
ments
                                Solve for first series element equal to S_1
                                Solve for second series element equal to S_2 - S_1

                        Confused S_n with original series 0pt
                                Wrote S_1 as first term of series and S_2 as second
                        Added partial sums together 0.5pt
                                Obtained results as S_1 and S_1 + S_2
                                Not recognizing S_n as partial sums
                        No Explanation .5
                                Simply wrote correct answer with no explanation
                        Right process, wrong implementation 1pt
                                Recognized S_n as partial sums
                                Wrote equations incorrectly, then solved
                        Major computational error 1pt
                                Correct equations and process
                                Several or severe arithmetic mistakes in result
                        Minor computational error 1.5pt
                                Correct equations and process
                                Arithmetic mistake in result

        (d)             Correct, full solution:
                                Recognize that S_n is the sequence of partial sums
                                Use convergence of the series to conclude that conditions of D
ivergence Test must not apply, so sequence cannot diverge or converge to anything other than 0
                                Conclude that the sequence must converge to 0

                        Applied Divergence Test incorrectly 0pt
                                Misunderstands conditions or results of divergence test
                                Incorrect result
                        No justification 0pt
                                Wrote "Converges" or "Diverges" without any explanation
                        Used Divergence Test on S_n 0.5pt
                                Applied divergence test to conclude that the sum of S_n diverg
es
                        Mistook formula for S_n as formula for term of sequence .5pt
                                Confuses the equation for S_n as the equation for the series
                                Found the sequence to converge to the limit of S_n
                        Correct Result without explanation 1pt
                                Found the sequence goes to 0, no explanation
                        Correct Result partial explanation without mentioning Divergence Test
2pt
                                Found the sequence goes to 0, wrote explanation without the Di
vergence Test
                        Correct Result minimal explanation 2pt
                                Found the sequence goes to 0, wrote "divergence test" and noth
ing further


Question 2 was graded by Matthew Dannenberg, matthew.dannenberg@stonybrook.edu. He can be cont
acted with any concerns about your score for this question.
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Question 3 rubric

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(a) 4pts, (b) 3pts, (c) 3pts

(a)

Partial credit level 1: Series identified as geometric series, "converges for $|ratio| < 1$" stated, no further work (plot shows interval (-1,1) or not present): 1pt

Partial credit level 2: Series identified as geometric series, "converges for $|ratio| < 1$" stated, an attempt to compute ratio given but ratio incorrect, no plot given: 2pts

Partial credit level 3: same as above, plot given (plot may be incorrect but *consistent* with the ratio calculations): 3pts

Correct and complete solution: Series identified as geometric series, "converges for $|ratio| < 1$" stated, ratio computed correctly, plot is correct.

Everything is correct but no plot given: lose .05pt

For all levels: lose .5 point if ratio=1 given as convergent (no penalty if $|r| < 1$ but endpoints included on the plot)

Note: some students used ratio test. This test wasn't covered in class yet and shouldn't be used for geometric series. Correct applications of ratio test receive 1 pt.

(b) NOT GRADED ON THE NUMBER OF CORRECT ANSWERS.

Partial credit level 0.5: statement that series converges for $|r| < 1$, further work inconsistent: 0.5pts

Partial credit level 1: converges at 0, 1pt

Partial credit level 2: converges for $|ratio| < 1$, ratio incorrectly identified but work is consistent; $c = 0$ marked as "convergent" 2pts (1.5 pts only if the value of the parameter is talen to be the ratio),

Partial credit level 2.5: ratio correctly identified, "converges for $|ratio| < 1$" stated, given numbers compared to the ratio but with small numerical mistakes or $r = 1$ or $r = -1$ incorrectly labeled as convergent, 2.5pts

Correct and complete solution: ratio correctly identified, "converges for $|ratio| < 1$" stated, all answers correct, 3pts

Note: Due to instructors' oversight, the version of the question in 127.02 included a series that is undefined for $l = 0$. (This issue would not arise if the summation started with $n = 1$ or if the numerator had exponent $(n + 1)$ instead of $(n - 1)$.) Most students overlooked this issue as well, stating that the series converges for $l = 0$. Such answers were given credit; the few students who noticed the issue were given 0.5 bonus points.

(c)

Partial credit level 1: using the sum formula for geometric series, but incorrect ratio and first term and/or bad value chosen: 1pt

Partial credit level 2: correct manipulations with $a + ar + ar^2 + \cdots = \frac{a}{1-r}$ formula, some mistake with first term or ratio: 2pt

Partial credit level 3: appropriate parameter value chosen, correct application of the sum formula, small arithmetic mistake in the final answer: 2.5pts

Correct and complete solution: correct application of the sum formula for an appropriate parameter value, correct answer: 3 pts

Question 3 was graded by Runjie Hu, runjie.hu@stonybrook.edu. He can be contacted with any concerns about your score for this question.

Question 4 rubric

Before contacting the instructor about your score, please REVIEW the RUBRIC CAREFULLY. You will plobably understand why points were taken off. If you have any concerns, please contact the instructor who graded this question for all students (see contact information at the end of the rubric).

Incorrect steps are B (2pts), C(2pts), E(3pts), F(3pts)
In A, the function is continuous and positive, and decreasing on $(1, +\infty)$, as required by the Integral test. A few students pointed out that the interval where f decreases is not stated in the solution, and that f increases from 0 to about 0.5. A small extra credit was awarded for this observation.
B: mistake in integration, $du = 2xdx$, not xdx, another mistake with antiderivative of $\frac{1}{u^2}$; Hermione's answer for the antiderivative is actually correct when mistakes are combined.
Partial credit: Spotting mistake, not providing correct calculation: 1pt
Complete solution: Spotting mistake +providing correction: 2pts
C: cannot plug in infinity into aniderivatives for improper integrals, must work with limits of integrals over finite intervals
Partial credit: spotting that infinity shouldn't be plugged in but not providing correct calculation: 1pt
Complete solution: Spotting mistake +providing correction: 2pts
E: two mistakes
(1) Hermione draws boxes on half-integers, the width of the boxes is 0.5, which gives $0.5(\frac{1}{(1^2+1)^2} + \frac{1.5}{(1.5^2+1)^2} + \frac{2}{(2^2+1)^2} + \frac{2.5}{(2.5^2+1)^2} + ..)$, not the terms of the series
(2) Boxes should go under the graph when working with convergence
Partial Credit - level 1: spotted (2) but not (1), made picture on half-integers repeating mistake (1): 1 pt
Partial Credit - level 2: spotted (2) but not (1), explained that boxes must be inside or drew unlabeled boxes under graph: 1.5 pt
Partial Credit - level 3: spotted mistake (2), didn't point out mistake (1), but made a correctly labeled picture: 2.5 pts
Complete solution: spotting both mistakes, providing correction: 3pts
F: The given Riemann sums are not a close approximation of the integral in this case, so Hermione's argument gives no conclusion.
Correct answer: when boxes are drawn under graph, the series is represented by the total area of boxes, *SMALLER* than the area under graph. Area under graph=integral=finite number since the integral converges, so series has finite sum and is convergent.
Partial credit: if mistake pointed out but explanation vague or unsatisfactory: 1 or 2pts
Complete solution: must clearly state that the area of rectangles representing series is SMALLER than the finite value of the improper integral, 3pts
Question 4 was graded by Olga Plamenevskaya, olga.plamenevskaya@stonybrook.edu. She can be contacted with any concerns about your score for this question.