

# Unit III. Lessons distribution and self-assessment questions

- Lesson 1. Sections 1 to 4.
  1. Does the series of general term  $a_n = (-1)^n n$  diverge or oscillate?
  2. What is the sum of the geometric series of ratio  $r = 1/2$  and  $a_1 = 1$ ?
  3. Does the geometric series converge if the ratio is less than 1?
  4. Can we group terms in a series without affecting convergence?
  5. What type of series never oscillate?
  
- Lesson 2. Sections 5 to 6.4.
  1. In which property of the sequences is based the Cauchy's criterion of convergence?
  2. What characterizes the sequence of partial sums of a series of positive terms?
  3. The Riemann series are of the form  $\sum 1/n^\alpha$ , with  $\alpha \in \mathbb{R}$ . True or false?
  4. To calculate the sum of  $\sum a_n$ , can we replace  $a_n$  for an equivalent infinitesimal?
  5. In the root test, if the limit is equal to 1, it is an inconclusive case. True or false?
  
- Lesson 3. Sections 6.5 to 6.8.
  1. Is it true that the quotient test and the root test give always the same result?
  2. To study the convergence of a S.P.T., when would you use Raabe's test? Why?
  3. Is it necessary to use the logarithmic criterion to study the convergence of  $\sum 1/\ln n$ ?
  4. What has to do the logarithmic test and the Riemann series?
  5. The condensation test is usually the first option to study convergence, since it solves most of the cases. True or false?
  
- Lesson 4. Section 7.
  1. If all the terms of a series are negative, except a finite number of them, can we apply to this series the criteria for S.P.T.?
  2. Find a series of positive and negative terms, which is unconditionally divergent.
  3. Consider a S.P.N.T. whose positive and negative subseries are divergent. We can rearrange it so that it is divergent only if  $a_n \rightarrow 0$ . True or false?
  4. What is the first step that we should take in the study of a S.T.P.N?
  5. Every alternating series whose general term tends to zero is convergent. True or false?
  
- Lesson 5. Section 8.
  1. To calculate the sum of a series, is it essential to study its convergence first?
  2. After decomposing  $a_n$  into simple fractions, in which cases can we sum the resulting series separately?
  3. Expand the expressions  $I_{2n}$  and  $P_{2n-1}$ .
  4. For what values of  $\alpha \in \mathbb{R}$  does the series  $\sum P_k(n) \alpha^n / n!$  converge?
  5. Can the series  $\sum 1/2^n$  be considered as hypergeometric with  $\alpha = 0, \beta = 1, \gamma = 2$ ?