# MATH 162 Solutions: QUIZ IV Friday The13th

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|  | *Answer any five of the following six questions. You may answer all six to obtain extra credit.*     |  | | --- | | ***1. Explain*** *why the following improper integral diverges:*    *Solution:*  MC900304955[1]*First note that x > ln x for all x ≥ e. Hence:*    *and so:*    *Recalling that*    *diverges by the p-test, we now invoke the Comparison Test to obtain the desired result.*  ***2.*** Compute the value of the following convergent improper integral. Assume  that *b* is a positive constant.    *Solution:*  *Using the definition of improper integral, we find:* |   *The last limit uses the fact that b > 0.*   |  |  |  | | --- | --- | --- | |  | ***3***. Evaluate (i.e. find the exact value) the following convergent improper integral.  Show your work! Calculator solutions are not acceptable.    *Solution:*  *Using the definition of improper integral:*    ***4.*** Evaluate (i.e. find the exact value) the following convergent improper  integral. Show your work! Calculator solutions are not acceptable.    *Solution:*  *Using the definition of improper integral:*    ***5.*** Determine convergence or divergence. *Justify your answer! (That is, if you use the comparison test, exhibit the function that you choose to use for comparison and show why the appropriate inequality holds.)* Calculator solutions are not acceptable.    *Solution:*  *To apply the comparison test, observe that, for all x ≥ 13:*    *Applying the p-test, the improper integral*    *converges, and hence, invoking the Comparison Test, the original improper integral must converge.*  **6.** Determine convergence or divergence. *Justify your answer! (That is, if you use the comparison test, exhibit the function that you choose to use for comparison and show why the appropriate inequality holds.)* Calculator solutions are not acceptable.    *Solution:*  *To apply the comparison test, observe that, for all x ≥ 13:*    *Since, the improper integral*    *clearly diverges, the original improper integral must diverge as well.*  ***Extra Extra Credit:***  *(Hint: Try using the Comparison Test.)*  *Solution:*  MC900141503[1]*Since x2 > x4 for 0 ≤ x < 1, 1– x2 < 1 – x4, and thus*  *for 0 ≤ x < 1.*  *Now .*  *Thus, invoking the Comparison Test, the original integral converges also.* | | |  | | |