**MATH 162 Solutions: QUIZ III**

***1.*** Explain why the following improper integral diverges:



*Solution:*

*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:*



***3***. Evaluate the following convergent improper integral. Show your work! Calculator solutions are not acceptable.



*Using the definition of improper integral:*



***4.*** Evaluate the following convergent improper integral. Show your work! Calculator solutions are not acceptable.



*Solution:*

*Using the definition of improper integral:*



For each of the following improper integrals, determine convergence or divergence. *Justify each 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.

***5.*** 

*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.*** 

*Solution:*

*To apply the comparison test, observe that, for all x ≥ 13:*



*Since, the improper integral*

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*clearly diverges, the original improper integral must diverge as well.*

***Extra Extra Credit:***

* (Hint: Try using the Comparison Test.)*

*Solution:*

*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.*