**MATH 162 Solutions: Quiz IV**

1. Find the exact value of the improper integral  .

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1. Determine whether the improper integral  converges or diverges. Explain your reasoning.

*Solution: We begin by comparing the order of magnitude of the numerator with that of the denominator.*



Since we know that  converges (due to the p-test), we conjecture that our original improper integral does as well. Toward this end we invoke the Comparison Theorem.



*Now since any non-zero multiple of a convergent integral converges, it follows from the Comparison Test that our original improper integral converges.*

1. *Determine whether the improper integral  converges or diverges. Explain your reasoning.*

*Solution: We begin by comparing the order of magnitude of the numerator with that of the denominator.*

**

*Since we know that  diverges (due to the p-test), we conjecture that our original improper integral diverges as well. Toward this end we invoke the Comparison Theorem.*

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*Now since any non-zero multiple of a divergent integral diverges, it follows from the Comparison Test that our original improper integral diverges.*

1. *Below are graphs of the function and a mystery function g(x) satisfying g(0) = 0.*
   1. On the graph, label which is f(x) and which is g(x). Explain your answer in the space below.

*Solution: y = f(x) is a decreasing function, f must be the orange graph.*

*Furthermore, since g(0) = 0, g must be the oscillating (blue) graph.*

* 1. Based on the graph, determine if it is possible to tell whether the improper integral  converges or diverges. Explain your answer.

*Solution: Since *

*it follows from the p-test and the Comparison Test that*

* diverges. Since g (eventually) is dominated by f, we can draw no conclusion about the convergence or divergence of *

*Nothing was ever achieved without enthusiasm.*

- Emerson