Quiz 4

MATH 19B - Discussion Section C
November 3, 2016

Name & ID # : _____

Directions: Leave your final answer in exact form and box it in.
Formulas: Integration by Parts for integrals is defined as:

$$\int u\,\mathrm{d}v = uv - \int v\,\mathrm{d}u \quad \text{and} \quad \int_a^b u\,\mathrm{d}v = uv\Big|_a^b - \int_a^b v\,\mathrm{d}u$$

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(1) (a) Argue why $\int_{-1}^{0} x^2 e^x\,\mathrm{d}x > 0$ and $\int_0^1 x^3 e^x\,\mathrm{d}x > 0$.

(b) Evaluate:

$$\int_{-1}^{0} x^2 e^x\,\mathrm{d}x$$

$$\int_0^1 x^3 e^x\,\mathrm{d}x$$

(c) Explain using the results of parts (a) and (b) to prove $2.5 < e < 3$.

(2) (a) Circle the answer to:

$$\int \frac{\ln(x)}{x^k}\,\mathrm{d}x \quad \text{where} \quad k \in \mathbb{Z} \setminus \{1\}$$

a) $\frac{x^{1-k}}{1-k}\left[\ln(x) - \frac{1}{1-k}\right] + \mathrm{C}$

b) $\frac{x^{k}}{k}\left[\ln(x) - \frac{1}{1-k}\right] + \mathrm{C}$

c) $\frac{x^{k-1}}{k-1}\left[\ln(x) - \frac{1}{k-1}\right] + \mathrm{C}$

d) $\frac{x^{1-k}}{1-k}\left[\ln(x) + \frac{1}{1-k}\right] + \mathrm{C}$

(b) What does the integral evaluate to if $k = 1$?