

Quiz 4

MATH 19B - Discussion Section B

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:

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

(1) (a) Argue why $\int_0^1 x^2 e^x \, dx > 0$ and $\int_0^1 x^3 e^x \, dx > 0$.

(b) Evaluate:

$$\int_0^1 x^2 e^x \, dx$$

$$\int_0^1 x^3 e^x \, dx$$

(c) Explain using the results of parts (a) and (b) to prove $2 < e < 3$.

(2) (a) Circle the answer to:

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

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

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

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

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

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