

Last Name: SOLUTIONS

First Name: _____

Student ID: _____

Quiz 4 (A)

Question 1. (5 marks) Find the following. Simplify your final answer.

(a) (5 marks) $\int_1^2 \frac{x^2+2x}{x^3+3x^2-1} dx$

$$= \int_3^{19} \frac{x^2+2x}{u} \cdot \frac{du}{3(x^2+2x)} = \frac{1}{3} \int_3^{19} \frac{1}{u} du$$

$$= \frac{1}{3} \ln|u| \Big|_3^{19} = \frac{1}{3} \ln 19 - \frac{1}{3} \ln 3 = \frac{1}{3} \ln\left(\frac{19}{3}\right)$$

LET $u = x^3 + 3x^2 - 1$

$du = (3x^2 + 6x) dx$

$$\frac{du}{3x^2+6x} = dx$$

IF $x=1 \Rightarrow u = 1^3 + 3(1)^2 - 1 = 3$

$$x=2 \Rightarrow u = 2^3 + 3(2)^2 - 1 = 19$$

(b) (5 marks) $\int_1^{e^\pi} \frac{\sin(\ln x)}{x} dx$

$$= \int_0^\pi \frac{\sin u}{x} x du = \int_0^\pi \sin u du$$

$$= -\cos u \Big|_0^\pi = -[\cos \pi - \cos(0)]$$

$$= -[-1 - (1)] = 2$$

LET $u = \ln x$

$du = \frac{1}{x} dx$

$x du = dx$

IF $x=1 \Rightarrow u = \ln 1 = 0$

$$\text{IF } x=e^\pi \Rightarrow u = \ln e^\pi = \pi \ln e = \pi$$