

Quiz 1

Name: _____

berg

1. Evaluate the integral:

[6]

a) $\int x^3 e^{x^4} dx$

$$= \int x^3 e^u \frac{du}{4x^3} = \frac{1}{4} \int e^u du = \frac{1}{4} e^u + C$$

① $u = x^4$
 ① $du = 4x^3 dx$
 $dx = \frac{du}{4x^3}$

$= \frac{1}{4} e^{(x^4)} + C$

[6]

b) $\int \frac{1}{x(\ln x)^3} dx$

$$= \int \frac{1}{(\ln x)^3} \frac{dx}{x} = \int \frac{1}{u^3} du = \int u^{-3} du$$

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

$$= \frac{u^{-2}}{-2} + C$$

$= \frac{(\ln x)^{-2}}{-2} + C$

2. Find the critical point of the function $f(x) = e^{3x} - e^{2x}$, showing all work.

[8]

$$f'(x) = 3e^{3x} - 2e^{2x} = 0$$

$$e^{2x}(3e^x - 2) = 0$$

$e^{2x} \neq 0$ for all x , so $3e^x - 2 = 0$

$$e^x = \frac{2}{3}$$

$x = \ln \frac{2}{3}$