

(10) + 5 Bonus points possible

Name: ANSWERS

Instructions: Use your own scrap paper and write your answers in the space provided.

1. Complete the following rules:

(a)  $\int \ln x \, dx = x \ln x - x + C$  (b)  $\int \frac{1}{\sqrt{x^2-1}} \, dx = \cosh^{-1} x + C$

(c)  $\int \frac{1}{x} \, dx = \ln|x| + C$  (d)  $\int \cosh x \, dx = \sinh x + C$

2. State the Integration by Parts Formula:

$$\int u \, dv = uv - \int v \, du$$

3. What mnemonic tells you how to choose  $u$  in the above formula?

LIATE OR LIPET

4. Integrate the following:

(a)  $\int_0^{\sqrt{\pi}} x^3 \sin x^2 \, dx = \frac{\pi}{2}$  (b)  $\int \frac{x^3}{\sqrt{1-x^2}} \, dx = \frac{(1-x^2)^{3/2}}{3} - \sqrt{1-x^2} + C$

(c)  $\int x^3 e^{2x} \, dx = e^{2x} \left( \frac{x^3}{2} - \frac{3x^2}{4} + \frac{3x}{4} - \frac{3}{8} \right) + C$  (d)  $\int \frac{e^{-3x}}{e^{-6x}-1} \, dx = \frac{1}{3} \tanh^{-1}(e^{3x}) + C$   
 or  $\frac{1}{3} \tanh^{-1}(e^{-3x}) + C$

**Bonus:**

1. Complete the following rules:

(a)  $\int \frac{1}{\sqrt{1+x^2}} \, dx = \sinh^{-1} x + C$  (b)  $\int \sec x \, dx = \ln|\sec x + \tan x| + C$

(c)  $\int \tan x \, dx = \ln|\sec x| + C$  or  $-\ln|\cos x| + C$  (d)  $\int \sec^3 x \, dx = \frac{1}{2} (\sec x \tan x + \ln|\sec x + \tan x|) + C$

(e)  $\frac{d}{dx} \log_a x = \frac{1}{x \ln a}$