

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) $\int x^n \, dx = \frac{x^{n+1}}{n+1} + C$ ($n \neq -1$)

(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) $\int \frac{x^3}{\sqrt{4-x^2}} \, dx = \frac{(4-x^2)^{3/2}}{3} - 4\sqrt{4-x^2} + C$

(c) $\int x^2 e^{3x} \, dx = e^{3x} \left(\frac{x^2}{3} - \frac{2x}{9} + \frac{2}{27} \right) + C$ (d) $\int \frac{e^{-x}}{e^{-2x} - 1} \, dx = \frac{\tanh^{-1}(e^x) + C}{\text{or } \tanh^{-1}(e^{-x}) + C}$

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