

Math 212 1XW Quiz 1

June 8, 2020

14 + 2 Bonus pts

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) $\int \frac{1}{1-x^2} \, dx = \tanh^{-1} x + C$

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

(e) $\int \sec x \, dx = \ln|\sec x + \tan x| + C$ (f) $\int \sec^3 x \, dx = \frac{1}{2}(\sec x \tan x + \ln|\sec x + \tan x|) + C$

(g) $\int \frac{1}{1+x^2} \, dx = \tan^{-1} x + C$ (h) $\cosh^2 x - \sinh^2 x = 1$

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

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) $\int \sin^5 x \cos^3 x \, dx = \frac{\sin^6 x}{6} - \frac{\sin^8 x}{8} + C$ (d) $\int \sec^2 \theta \ln \tan \theta \, d\theta = \tan \theta \ln \tan \theta - \tan \theta + C$

OR $-\frac{\cos^8 x}{8} + \frac{\cos^6 x}{3} - \frac{\cos^4 x}{4} + C$

Bonus:

1. What would be an appropriate (trig) substitution to compute the following?

$\int \frac{x^2}{\sqrt{x^2+9}} \, dx$: $x = 3 \tan \theta$

2. Write down the partial fractions decomposition of $\frac{12}{x^3(x^2+4)^2(x^2-1)}$. You may use A, B, C, \dots for the arbitrary constants. You need not find the values of the arbitrary constants.

$\frac{A}{x} + \frac{B}{x^2} + \frac{C}{x^3} + \frac{Dx+E}{x^2+4} + \frac{Fx+G}{(x^2+4)^2} + \frac{H}{x-1} + \frac{I}{x+1}$