

Math 2315 - Calculus II

Homework #2 - 2007.08.31

Due Date - 2007.09.07

Name: _____

Part 1: Problems from sections 7.3 and 7.4.

Part 2: The *fun* problems.

1. Consider the following integral:

$$\int \frac{t^5}{\sqrt{t^2 + 2}} dt.$$

a) Solve the integral in two ways, first by using the substitution $u = \sqrt{2} \tan(u)$ and then solving the resulting trigonometric integral.

b) Solve the integral by the method of integration by parts. It might be helpful to rewrite the integral as follows:

$$\int t^4 \frac{t}{\sqrt{t^2 + 2}} dt,$$

and let $u = t^4$ and $v' = \frac{t}{\sqrt{t^2+2}}$.

c) Your two answers, which should both be in terms of the original variable t . If you have done everything correctly, your answer to part a) should look different than your answer to part b). Show that your answer to part a) is indeed equal to your answer to part b).

2. Consider the following relationship between x and z :

$$z = \tan\left(\frac{x}{2}\right)$$

Show that under the above relation, one has

$$\begin{cases} \cos(x) = \frac{1-z^2}{1+z^2} \\ \sin(x) = \frac{2z}{1+z^2}. \end{cases}$$

Hint: Using double angle identities will help!

3. Using problem 2, show the following:

$$\int \frac{1}{1 + \cos(x)} dx = \tan\left(\frac{x}{2}\right) + C$$