Worksheet 10/10/19 - MAC 2312 Group nr. ____ **NAMES:** _____

1. Evaluate (a) $\int \sin^2 x \cos^3 x \, dx$ (b) $\int \tan^2 x \sec^4 x \, dx$

2. The region bounded between the graph of $\sin x$ and the x-axis when $x \in [0, \pi]$ is rotated around the y-axis; the solid formed has volume V_1. Then the same region is rotated around the x-axis; the solid formed has volume V_2. Find V_1 and V_2 and observe that $V_1 = 4V_2$.

3. (a) Derive a reduction formula for

$$\int \sin^n x \, dx \, ,$$

where n is a positive integer. You may check formula (3), with $m = 0$, on bottom of page 494 textbook to confirm your result.

(b) Use part (a) to derive a recursion formula for

$$A_n = \int_0^{\pi/2} \sin^n x \, dx \, .$$

(c) Find A_1 directly, then find A_3, A_5 using the recursion formula. Write a general formula for A_n when n is odd.

(d) Find A_0 directly, then find A_2, A_4 using the recursion formula. Write a general formula for A_n when n is even.

The general formulas for A_n are the so-called *Wallis sine formulas.*