Math 102: Discovery Project

Goal: To develop your ability to be an independent learner and to explain what you have learned to others.

Instructions: You will figure out how to solve one of the following integrals. You will write up an explanation in a one page paper in which you both solve the problem but also explain the approach to solving the problem. At the end of the project, you will present your work to your group in a 5-8 minute presentation.

Steps:

1. Use your textbook (Sect 8.2) to study how to solve your problem. Write up a one page (or less) explanation in which you show how to solve the problem but also explain the logic behind your approach. In writing up your explanation, imagine a classmate asking you - "why did you do that? "

   Hand in this draft write up to me by Friday Oct. 27th at 5pm.

2. I will collect all the write up, bundle together the writes up for the same problem into a set and return copies of the appropriate set to each person on Monday October 30th. You will read through the write ups of the other people doing the same problem you did and then you will rewrite your paper. For this assignment, you have permission to borrow ideas and approaches from your classmates. However, when you do your rewrite, you should not copy their write up word for word.

   When you do the rewrite, you will also fill out a reflection log in which you say what you liked about how other people did their drafts and what ideas you incorporated from their drafts into your final version.

   You will hand in your final draft and reflection log by Friday November 3rd at 5pm.

3. For each problem, I will assess your final draft using the Master, Near Mastery, Tentative, Unsure rubric. I will select Mastery write ups for each problem, put them into Exemplar packet and give a copy to each person on Monday Nov 6th.

4. On Wed Nov 8th, each person will present their problem and how to solve it to their group in a 5-8 minute presentation. You may use the approach from your final write up and/or the approach in the Exemplar packet.
Here are the problems. They all involve integrals of trigonometric functions. Some of these integrals can be evaluated using the integral tables. However your goal is to explain where the formula in the integral table comes from.

1. $\int \sin^3 x \, dx$ - linked to formulas 67, 68.

2. $\int \sin^2 x \cos^3 x \, dx$

3. $\int \cos^2 x \, dx$

4. $\int \sin 2x \cos 4x \, dx$ - linked to formulas 79, 80, 81

For some of these integrals, you will need to use the double angle formulas (see Appendix D). You can start as a given with the following addition formulas:

\[
\begin{align*}
\sin(x \pm y) &= \sin x \cos y \pm \cos x \sin y \\
\cos(x \pm y) &= \cos x \cos y \mp \sin x \sin y
\end{align*}
\]

(1) \hspace{1cm} (2)

To solve your problem, you may need to manipulate these formulas to get other formulas, such as the double angle formulas. Your write up should include these calculations when needed.