Math 76 Assessment 5 §3.1 Integration by Parts

Things to remember:

1. The problem to complete is shown below. Write your name and solution on the next page where instructed.

2. Please make sure your full name is written neatly in the box.

3. Your score will be determined by **Mechanics** (2 points) and by **Content** (3 points).

4. The following rubric will be used for **Mechanics**:

Clear neat work, steps in order and easily followed, proper use of notation	2
Mostly clear work; minor errors in notation or skipped steps	1.5
Steps/handwriting hard to follow/read; major errors in notation	1
No discernible or relevant work, or work impossible to read/follow	0

5. You are not allowed to consult outside sources, including notes, books, the internet, or other people, while taking this assessment. Calculators are allowed only for basic numerical or scientific computations, not for graphing or algebra.

6. If you need more room, you may finish on a plain piece of paper or blank document.

7. When you are finished, create a legible, well-lit **.pdf file** of your work and upload it to Assessment 5 on Gradescope. If prompted, follow the directions to assign the page(s) of your submission that contain your work for the question. More info about submitting to Gradescope:

`http://bit.ly/gradescope-help`

Recall that a *reduction formula* is a formula to express an integral involving a power (say n) in terms of an integral that involves a smaller power (for example, $n-1$).

Use integration by parts to work out a reduction formula for the given integral on the next page.

Your solution should include:

- (0.5 point) Statement of integration by parts formula;
- (1.5 point) Explanation and steps showing how integration by parts is used to find the reduction formula;
- (1 point; 0 if no relevant work/explanation) Correct final answer.

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Version C

Assume n is a positive whole number with $n \geq 2$. Follow the directions on the previous page for the integral

$$\int x^n \cos(7x)\, dx.$$

Hint. Try expressing the above integral in terms of one or both of the following:

$$\int x^{n-1} \cos(7x)\, dx \quad \text{or} \quad \int x^{n-1} \sin(7x)\, dx.$$

Integration by Parts formula

$$\int u\,dv = uv - \int v\,du$$

1. write the Problem → $\int x^n \cos(7x)\, dx$

2. Integration by Parts →

$u = x^n \qquad dv = \cos(7x)$

$du = nx^{n-1} \qquad v = \frac{\sin(7x)}{7} + C$

3. Plug in values → $\int x^n \cos(7x)\, dx = (x^n)\left(\frac{\sin(7x)}{7}\right) - \frac{1}{7}\int \sin(7x)\, nx^{n-1}\, dx$

4. Simplify → $\int x^n \cos(7x)\, dx = \frac{x^n \sin(7x)}{7} - \frac{n}{7}\int x^{n-1} \sin(7x)\, dx$ ✓