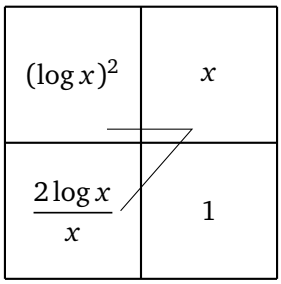
**Name:** *Caleb McWhorter — Solutions* **Quiz 2: Integration by Parts**
**MAT 296** **Fall 2017**

**Problem 1:** Integrate the following:

$$\int (\log x)^2 \, dx$$

*By LIATE, we choose* $u = (\log x)^2$ *and* $dv = 1$*, this gives box*




*which then gives...*

$$\begin{aligned}\int (\log x)^2 \, dx &= x(\log x)^2 - \int \frac{2\log x}{x} \cdot x \, dx \\ &= x(\log x)^2 - 2\int \log x \, dx \\ &= x(\log x)^2 - 2(x\log x - x) + C\end{aligned}$$

**Problem 2:** Integrate the following:

$$\int x^3 e^{2x} \, dx$$

*Using Tabular Integration:*

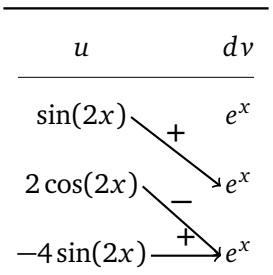
| $u$ | | $dv$ |
|---|---|---|
| $x^3$ | $+$ | $e^{2x}$ |
| $3x^2$ | $-$ | $\frac{e^{2x}}{2}$ |
| $6x$ | $+$ | $\frac{e^{2x}}{4}$ |
| $6$ | $-$ | $\frac{e^{2x}}{8}$ |
| $0$ | | $\frac{e^{2x}}{16}$ |

*So that we have*

$$\begin{aligned}\int x^3 e^{2x} \, dx &= \frac{1}{2}x^3 e^{2x} - \frac{3}{4}x^2 e^{2x} + \frac{3}{4}x e^{2x} - \frac{3}{8}e^{2x} + C \\ &= \frac{e^{2x}}{8}(4x^3 - 6x^2 + 6x - 3) + C\end{aligned}$$

**Problem 3:** Integrate the following:

$$\int e^x \sin(2x)\, dx$$




*Then the table gives*

$$\int e^x \sin(2x)\, dx = e^x \sin(2x) - 2e^x \cos(2x) - 4\int e^x \sin(2x)\, dx$$

$$5\int e^x \sin(2x)\, dx = e^{2x} \sin(2x) - 2e^{2x} \cos(2x) + C$$

$$\int e^x \sin(2x)\, dx = \frac{e^x \sin(2x) - 2e^x \cos(2x)}{5} + C$$

$$\int e^x \sin(2x)\, dx = \frac{e^x}{5}\big(\sin(2x) - 2\cos(2x)\big) + C$$