# Math 1B Quiz 1

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Thursday, 26 June 2008

Name: _____ Score: /10

*You have twenty minutes to complete the following quiz. The quiz is closed-note but open-chalkboard. Although you do not need to write down every step of your calculation, you do need to show enough work that I know how you did each problem (no points will be given for simply writing down the correct answer). Partial credit will be awarded for correct work. Please box your final answers. Use the back of the page for extra work if necessary.*

*In the following integrals, you do not need to simplify. You do need to include "+C" or "plus an unknown constant" or some such remark in any indefinite integral.*

1. (5 pts) Compute the following integral by integration by parts.

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

*We integrate by parts twice, first differentiating $x^2$, then differentiating $x$:*

$$\begin{aligned}
\int x^2 \cos 2x \, dx &= x^2 \left(\frac{1}{2}\sin 2x\right) - \int (2x)\left(\frac{1}{2}\sin 2x\right) dx \\
&= \frac{x^2 \sin 2x}{2} - \left(x\left(-\frac{1}{2}\cos 2x\right) - \int \left(-\frac{1}{2}\cos 2x\right) dx\right) \\
&= \frac{x^2 \sin 2x + x\cos 2x}{2} - \frac{1}{2}\int \cos 2x \, dx \\
&= \frac{2x^2 \sin 2x + 2x\cos 2x - \sin 2x}{4} + C
\end{aligned}$$

2. (5 pts) Compute the following trigonometric integral.

$$\int \sec^4 t \, dt$$

*Knowing that* $\sec^2 = d\tan$*, we convert two secants into tangents via the Pythagorean theorem:*

$$\int \sec^4 t \, dt = \int \left(1 + \tan^2 t\right) \sec^2 t \, dt$$

$$
\begin{aligned}
&= \int \left(1+u^2\right) du \ \textit{where } u = \tan t \\
&= u + \frac{u^3}{3} + C \\
&= \tan t + \frac{\tan^3 t}{3} + C
\end{aligned}
$$

3. (0 pts) Who is your favorite Beatle? And why?

   *John, Paul, George, and Ringo are all acceptable answers.*