Math 143
Fall, 2006 Name: **Solutions**
Quiz 10 - §8.2

Complete the following problems by computing the following integrals. Show all work to receive full credit.

1. $\int (x^2 - 5x)e^x \ dx$

$$u = x^2 - 5x \qquad dv = e^x \ dx$$
$$du = (2x-5) \ dx \qquad v = e^x$$
$$\int (x^2 - 5x)e^x \ dx = (x^2 - 5x)e^x - \int (2x-5)e^x \ dx$$
$$u = 2x - 5 \qquad dv = e^x \ dx$$
$$du = 2 \ dx \qquad v = e^x$$
$$= (x^2 - 5x)e^x - \left((2x-5)e^x - \int 2e^x \ dx\right)$$
$$= (x^2 - 5x)e^x - (2x-5)e^x + \int 2e^x \ dx$$
$$= (x^2 - 5x)e^x - (2x-5)e^x + 2e^x + C$$

2. $\int e^x \sin x \ dx$

$$u = e^x \qquad dv = \sin x \ dx$$
$$du = e^x \ dx \qquad v = -\cos x$$
$$\int e^x \sin x \ dx = -e^x \cos x + \int e^x \cos x \ dx$$
$$u = e^x \qquad dv = \cos x \ dx$$
$$du = e^x \qquad v = \sin x$$
$$= -e^x \cos x + e^x \sin x - \int e^x \sin x \ dx$$
$$\int e^x \sin x \ dx = -e^x \cos x + e^x \sin x - \int e^x \sin x \ dx$$
$$2\int e^x \sin x \ dx = -e^x \cos x + e^x \sin x$$
$$\int e^x \sin x \ dx = -\frac{1}{2}e^x \cos x + \frac{1}{2}e^x \sin x$$

3. $\int \tan^{-1} x \; dx$

$$
\begin{aligned}
u &= \tan^{-1} x & dv &= dx \\
du &= \frac{1}{1+x^2} \; dx & v &= x
\end{aligned}
$$

$$
\begin{aligned}
\int \tan^{-1} x \; dx &= x \tan^{-1} x - \int \frac{x}{1+x^2} \; dx \\
&= x \tan^{-1} x - \frac{1}{2} \ln \mid 1 + x^2 \mid + C
\end{aligned}
$$