**Jan 24, 2003** **Name**_____

**Math 112.01 – Quiz 2 and Solutions**

**1)** Evaluate $\int x\tan(x^2)dx$

**Solution:** Let $u = x^2$, then $du = 2xdx$ and $\frac{du}{2} = xdx$. Therefore, $\int x\tan(x^2)dx = \frac{1}{2}\int \tan(u)du$. To evaluate the latter integral we first write $\frac{1}{2}\int \tan(u)du = \frac{1}{2}\int \frac{\sin(u)}{\cos(u)}du$ then make another substitution: $v = \cos(u)$, so $dv = -\sin(u)du$. We then obtain

$$\frac{1}{2}\int \frac{\sin(u)}{\cos(u)}du = \frac{-1}{2}\int \frac{dv}{v} = \frac{-1}{2}\ln|v| + C = \frac{-1}{2}\ln|cos(u)| + C = \frac{-1}{2}\ln|\cos(x^2)| + C$$

**2)** Evaluate $\int_e^{e^2} \frac{dx}{x\ln^2(x)}$

**Solution:** Let $u = \ln(x)$, then $du = \frac{dx}{x}$. Also note that the limits of integration should be changed to from $u(e) = \ln(e) = 1$ to $u(e^2) = \ln(e^2) = 2\ln(e) = 2$. So

$$\int_e^{e^2} \frac{dx}{x\ln^2(x)} = \int_1^2 \frac{du}{u^2} = \frac{-1}{u}\Big|_1^2 = -(\frac{1}{2} - 1) = \frac{1}{2}$$