University of Utah
Math 1220, Fall 2007
Name: Solutions

Quiz # 2
Time: 15 minutes

Please try to carefully explain the steps leading to your solutions.
Part 1: (10 points) Evaluate the integral:

$$\int \frac{1}{4x^2+2}dx$$

We write this as $\int \frac{1}{u^2+1}du$ (which we know how to integrate) by using the substitution: $\begin{cases} u = \sqrt{2}\cdot x \\ du = \sqrt{2}\,dx \end{cases}$

$$\int \frac{1}{4x^2+2}dx = \frac{1}{2}\int \frac{1}{2x^2+1}\cdot dx = \frac{1}{2\sqrt{2}}\int \frac{1}{u^2+1}du = \frac{1}{2\sqrt{2}}\tan^{-1}u + C$$

$$= \frac{1}{2\sqrt{2}}\tan^{-1}(\sqrt{2}x) + C$$

Part 2: (10 points) Find the derivative of the function $f(x) = (\cos x)^x$. Note that this function is only defined on intervals where $\cos x > 0$.

We start by writing: $f(x) = e^{\ln(\cos x)\cdot x}$
which we differentiate by the chain rule.
We will need: $[\ln(\cos x)]' = \frac{1}{\cos x}\cdot(-\sin x) = -\tan x$ (chain rule)

$[\ln(\cos x)\cdot x]' = -\tan x\cdot x + \ln(\cos x)$ (product rule)

Therefore: $f'(x) = \left[e^{\ln(\cos x)\cdot x}\right]' = (-\tan x\cdot x + \ln(\cos x))\cdot e^{\ln(\cos x)\cdot x}$