**Quiz 5** **Calculus 2** **3/7/2008**

Each problem is worth 5 points. Clear and complete justification is required for full credit.

1. For what values of $k$ does the function $y = \cos kt$ satisfy the differential equation $y'' + 4y = 0$?

$y' = k(-\sin kt) = -k\sin kt$

$y'' = -k^2 \cos kt$

$y'' + 4y = 0$

$(-) \quad -k^2 \cdot \cos kt + 4\cos kt = 0$

$(-) \quad \cos kt\,(4 - k^2) = 0$

$(-) \quad \begin{cases} \cos kt = 0 \to kt = \frac{\pi}{2} \to k \text{ depends on } t \\ 4 - k^2 = 0 \to k = \pm 2 \end{cases}$

$\to \boxed{k = \pm 2}$

Excellent!

2. Is $y = te^{-t}$ a solution to $y'' + 2y' + y = 0$?

$y' = 1 \cdot e^{-t} + t(-1) \cdot e^{-t} = e^{-t} - te^{-t}$

$y'' = -e^{-t} - (1 \cdot e^{-t} + t(-e^{-t}))$

$= -e^{-t} - e^{-t} + te^{-t}$

$= -2e^{-t} + te^{-t}$

$y'' + 2y' + y = 0$

$(-) \quad -2e^{-t} + te^{-t} + 2e^{-t} - 2te^{-t} + te^{-t} = 0$

$(-) \quad 0 = 0$

So yes! $y = te^{-t}$ is a solution

Great!