

### HOMWORK 4-PART B

1. Is it possible to find a function  $f(t, x)$  that is continuous and has continuous partial derivatives such that the functions  $x_1(t) = \cos t$  and  $x_2(t) = 1 - \sin t$  are both solutions to  $x' = f(t, x)$  near  $x = \frac{\pi}{2}$ ;

2. Suppose that  $y$  is a solution to the initial value problem  $y' = y^2 - \cos t^2 - \sin t$  and  $y(0) = 2$ . Show that  $y(t) > \cos t$  for all  $t$  which  $y$  is defined.;

3. Suppose that  $y$  is a solution to the initial value problem  $y' = (y^2 - 1)e^{ty}$  and  $y(1) = 0$ . Show that  $-1 < y(t) < 1$  for all  $t$  for which  $y$  is defined.