1. Find a Lipschitz constant, K, for the function $f(u,t) = u^3 + tu^2$ which shows that f is Lipschitz in u on the set $0 \leq u \leq 2$, $0 \leq t \leq 1$.
2. Show that the function $f(u,t) = t\sqrt{u}$, is not Lipschitz in u on $[0,1] \times [0,2]$.
3. Find two solutions to the initial value problem $y' = |y|^{1/2}$, $y(0) = 0$. What hypothesis of the Picard-Lindelöf Theorem is violated.