Homework-4 1. (i) Show that the curve X: [0, ] > R2, (X means very important) d(+)= (+, VI-t2) is NOT /smroth. (ii) Do the same for the curve  $\beta: [0,1] \rightarrow \mathbb{R}^2$  given by  $\beta(t) = (t,t''')$ . 2. (i) check that the book's definition of a surface is equivalent to that of owing. (ii) Any open subset of a surface is a purface. In particular, any open subject of the XY- plane is a surface. 3. If I, J CR are intervals and q: I-) I is a diffeomorphism then q'(+) +0 4. Consider the following curves. (i) check if they are regular. (ii) Find their unit tangent sector and speed at any time t. (a) d: (0,0) -) R2 d(t)= (toost, t)int) (b) d: R-) R2 d(t) = (t-sinf, 1-cost) (c) d: R-> R d(t) = (ekt cost, extint (d) d: R-> R3 d(t) = (acost, a sind, bt 970,670

(e) d: (0,0) -> 1R3 d(t)= (£, £+1, £+2) (2) Hote: a, b, The are constants, Example: (d) d'(t) = (-a sint, a cost, b) => Speed = || L'(6) || = Va762 +0 Hence dis regular also. Then unit tangent vector at time t = The (t) = 1 (-a sint, a cost, b). \* In 4(c), 4(d),4(e) find are length parametrications for base points t=0, t=0 and t=1 respectively. · Suppose d: I-) 123 is a curve with d"(t) =0. Show that d(I) is continued in a straight line.