From 6

HE, E' >0: IS* >0: F ||X, -X, || < 8* then

H(f+g(X,)- (f+g(X,)) || < E+E' = E* D

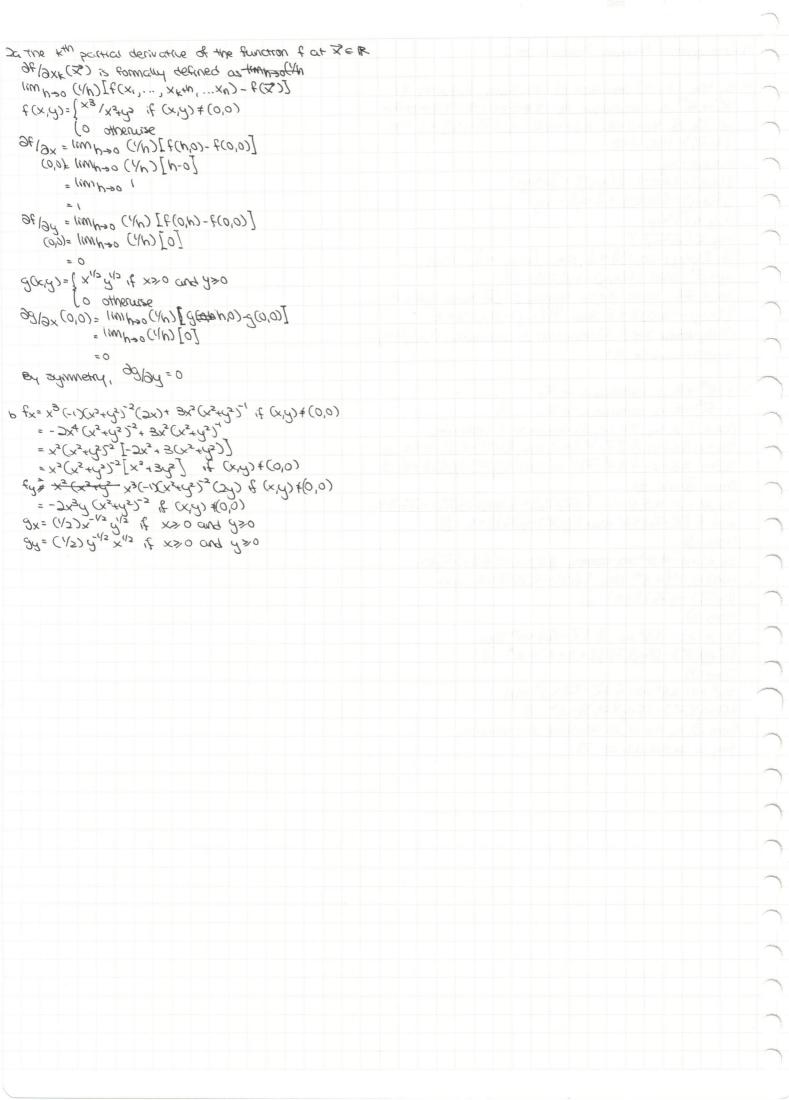
From D

HE* >0: IS* >0: F ||X, -X, || < 8* the)

H(f+g(X,)- (f+g(X,)) || < E* 8

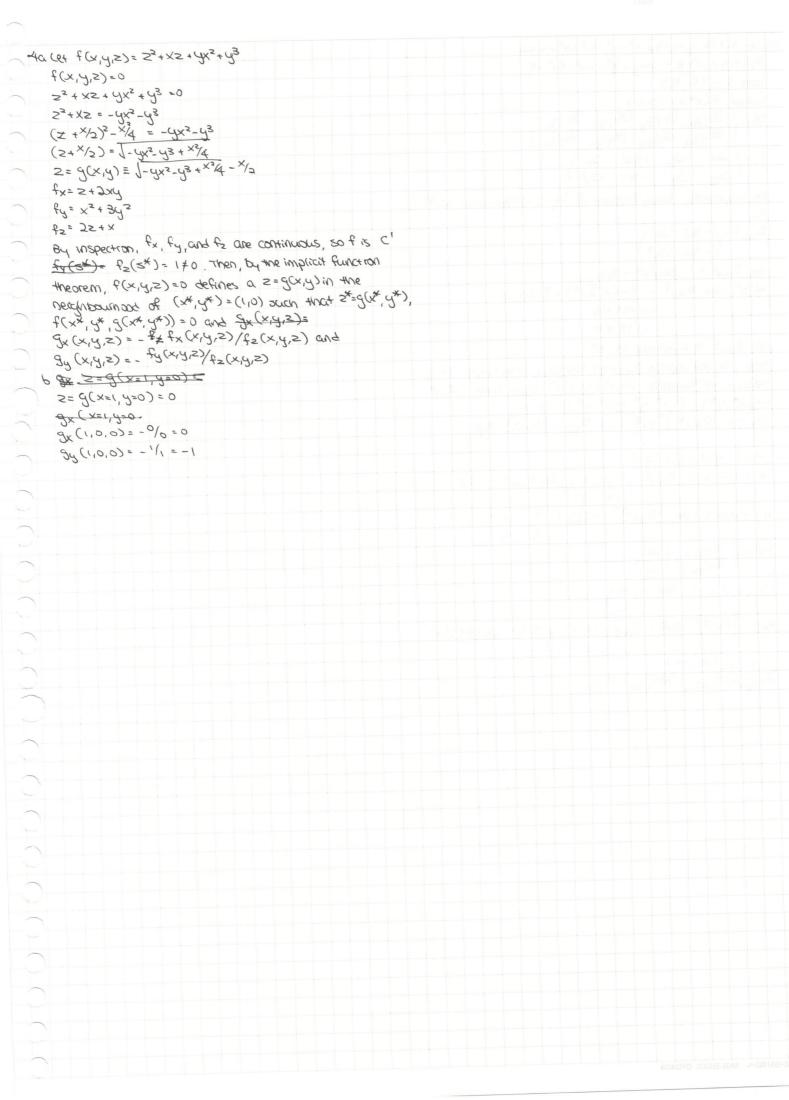
From 8, by the (E, 8) definition of continuity,

f+g & continuous at X...



```
30 (1= Zi=1 di laxi Hi=di>0 Zi=1 di=1
        Du=( dia dou ... dala)
                 = ( d1/x1 y5/x3 ... yr/xr)
   P D30 = 191810 91970 ... 91980
                           200 € ... 200 mg 6 6 mg 6 6 6
                          1949'r 949r ... 949an
   c let Div is dende the element in the ith now and ith
         column of Di. By definition of Di, Vije &1, ... L 3:
         Dig = 3;3; u = 3; (dj(xj) = 0 for all i + j. Then Die is
         a diagonal matrix so Die is a symmetric matrix. This
          is confirmed by inspection.
         let Dit denote the equals submotion of A with only the
          first k rows and columns retained. Then out = (-a,x,2)
                                                                                , and so on.
           det (-1)' det Dzu' = dixi2
          (-1)3 get D3103 = (g1x1,3 Xg23)
          (-1) k det Dzuk = (-1) k TT k (-a, xi2)
           since the determinant of a diagonal matrix is the product
           of its diagonal elements
                                                = TIK (dixi2)
                                                 >0 for all k
           Given 4: di > 0, assuming that u is well-defined then
            History is well-defined then Hixi +0 then Hixi >0.
            By the determinant test, Dzu is negative definite.
          TT D2 T is well-defined only if T is a vector of
             length L. Let 7 = (41,...,41)
             = \frac{(3/3)^{2} \times (3/3)^{2}}{(3/3)^{2}} = \frac{(3/3)^{2}}{(3/3)^{2}} = \frac{(3/3
                                      -25g5X25
                                         -yalxi2.
              3 Doug = (4, 45 ... 26) - 2/3/1/2 - 2/3/2 /2
                                    = -2,4x, -2-2,4xx, -... -2,4xx,
                                    = = Za - Zizi Dr. Mg x di Yi Xi
                                    <0 for all $ ≠0 ∈ Rn
                given 4:: di >0, assuming that a is cell-defined hence
                 A:: X! > 0
                 By checking 3 Dry, Dr & negative definite.
           e い(ダンキ い(ダ)+ Du(ダ)ズン・マ)+いとマーマ) **
                                    = 0+ (91/4 gs/7 ... g/x/-1 x/-1/-x/-1)
                                        + 1/2 (x1-1 x2-1-x2-1) Du(x1-1 x2-1-- x2-1)
```

= $d_1(x'_1-1) + d_2(x'_2-1) + \dots + d_1(x'_1-1)^2$ + $\frac{1}{2} \left[-d_1(x'_1-1)^2 - d_2(x'_2-1)^2 + \dots + d_1(x'_1-1)^2 \right]$ = $\sum_{i=1}^{n} d_i (x'_1-1) - \frac{1}{2}(x'_1-1)^2$

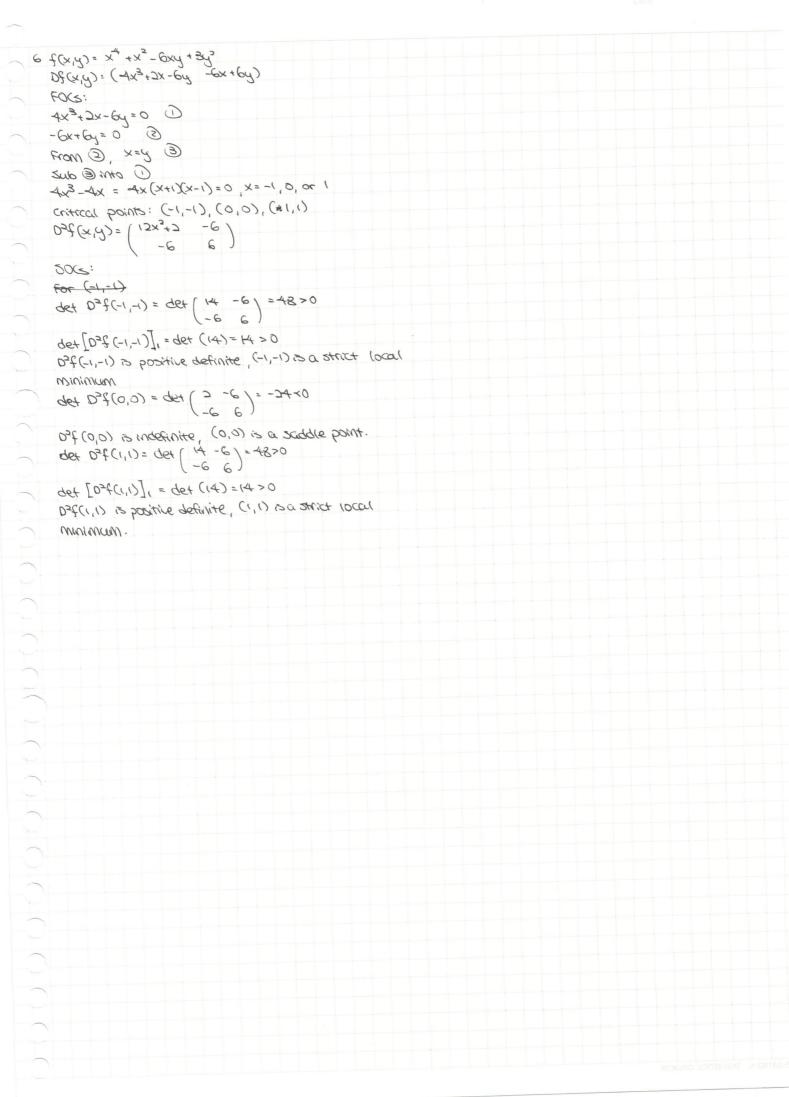


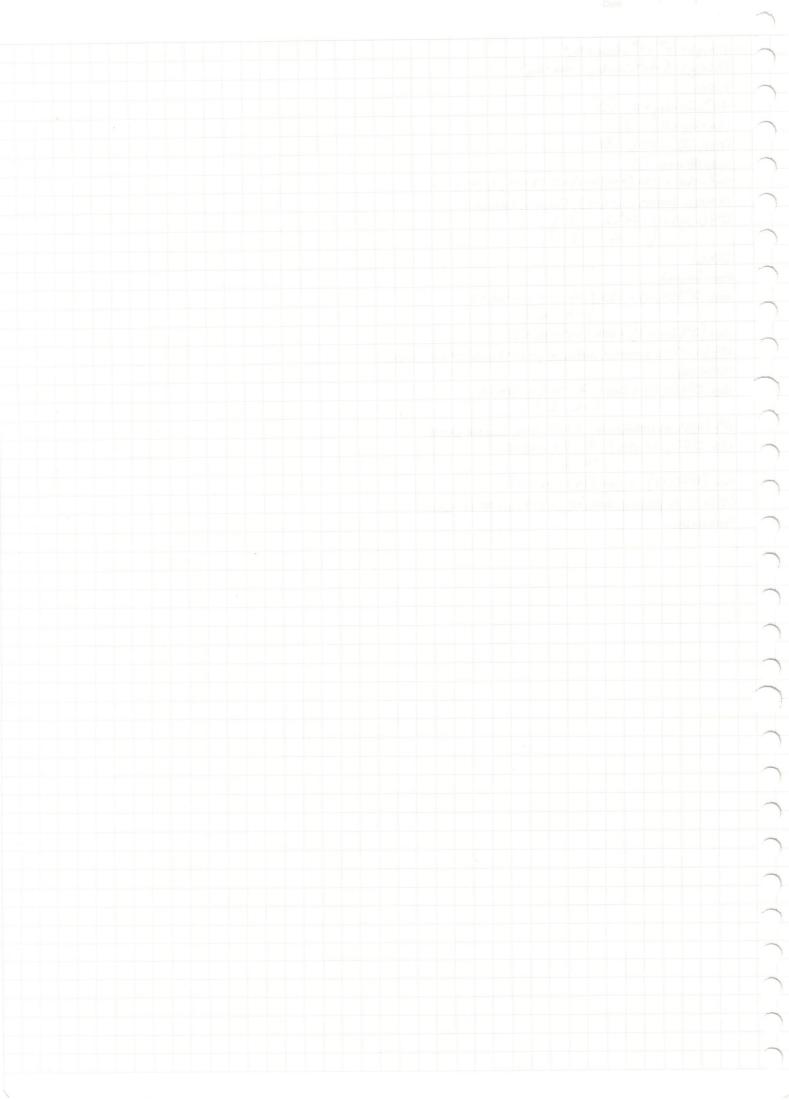
```
a (et fix (x,y,u,v) = x2-y2-u3+12+4=,
       f3(x,y,u,v) = 2xy+y2-2u2+3v4+8,
     and f = (f, f2)
     Given f(s^{*}) = (0,0)

Given f(s^{*}) = (0,0)

f(s^{*}) = (
       By inspection, each element of Df is continuous, so f is
       Dunf = (-32 24)
       det Dunt = -360213 + 801
        At 3th det Dunf = -36(22X13) +8(2X1)
                                                                             = - 144 +16
                                                                               =-128 = 0
        so Dunf is invertible at st
        Then, by the implicit function theorem, f(x, x, y, u, v) = (0, 0)
        defines of function (u,v) = g(x,y) such that (u^*,v^*)
= g(x^*,y^*), f(x^*,y^*,g(x^*,y^*)) = (0,0),
D_x g = -[Du,v^*] - D_x f and D_y g = -[Du,v^*] - D_y f
P (ain)= d(51-1)= (511)
          By cicumer's une [Dank]_1=-158 (15-5)

By cicumer's une [Dank]_1=-158 (15-5)
            \mathcal{D}^{x} = \left( \frac{\partial \mathcal{C}^{1}(9^{x})}{\partial \mathcal{C}^{1}(9^{x})} = \left( \frac{5^{2}}{2^{x}} \right) \right)
            A (2,-1,2,1), Dxf = (4)
            Dxd=-[Dant]-, Dxt= 1/58 (15-5/4)=1/58 (25'20)
           901/9x=13/35 91x1/9x=14/35
```





beop is notation is good make explicit the intermedicate step that

Jx2+y2 < 8 ⇒ Jx2 < 8 and Jy3 < 8 ⇒ x3 ×y < 8 so it ... namely ... notation is correct b Note: |foorf(₹))1+1g(₹))-g(₹))> |f+g(₹)-f+g(₹) Ecosy to construct problems to show continuity Do not need to prove continuity where obtions 20 20 2 3xf at (xy) \(\xi(0,0) \) found simply by different catally \(\x^3 / \x^2 + y^2\) Can simply daim that fx is continuous by mspection Arithmetic erior in tx Partial derivative can be written as (1 if (x,y):6p) can show that fine fx is non-continuous by finding some sequence & to show & such that 16m (2 15 not \$ 1 from some direction. c'implies differtiable, but not the revese Pottentiable # limpry - o f(h,h2)-f(0,0)-Dx(0,0)(h2)=0 simplify then check diagonal Etnin) 3 m. , our /n, 2/n, etc. Find partial devilatives at (0,0) by limit famla. tate compute pas elsewhere Find partial democrates at (0,4) (x,0) by limit with Particl derivatives John exist on the axes can show partial derivates not continuous to (0,0) from diaponals & Extra continuity weaker repured that differentiability can be not c' but still differentiable

for not continuous => for not differentiable

differentiable: "empulsee you can approximate a

a line" continuity nec for diff ability

4 Conrect to first check if f is c' Can be given "by inspection" (orrect to check fz (5+) \$0 Then by implicit for theorem

z=goxy)

= g(x*y*)

g has cont pt at (x*y*)

Not recessary to find the function 5 All polynomicals are c' (a) is all correct 6 Saddle - inch in some directors, decl in others Cinformaly) correct How to check global? · Find counterexcurple · Prove function is bounded 3 when providy taylor approx, evaluate tax Jacobian & Hessian at the point that you che approximative.

(c) can check definiteness in many ways

& notation is correct Taylor approx gives intuition behind definitions check.