Brief solutions to selected problems in homework 10

1. Section 14.6: Solutions, common mistakes and corrections:

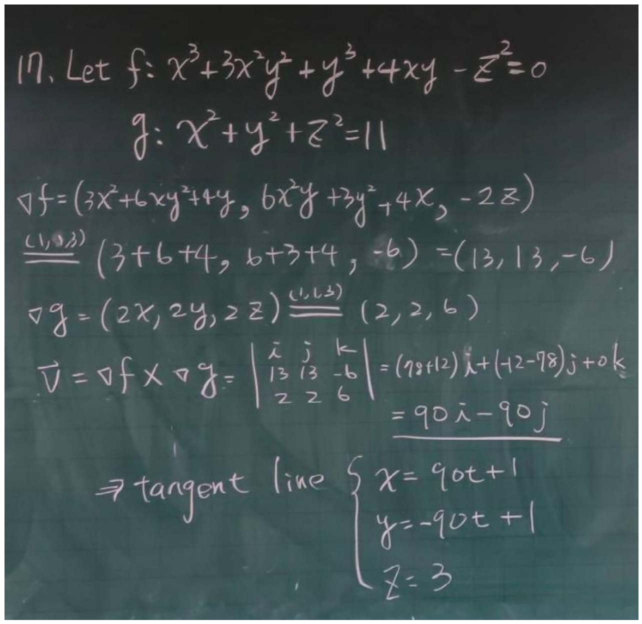

Figure 1: Solution to Section 14.6, problem 17

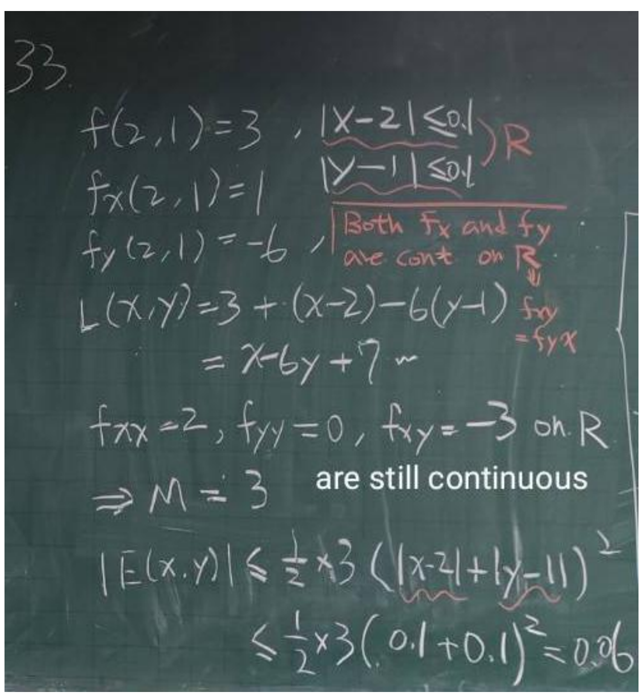

Figure 2: Solution to Section 14.6, problem 33

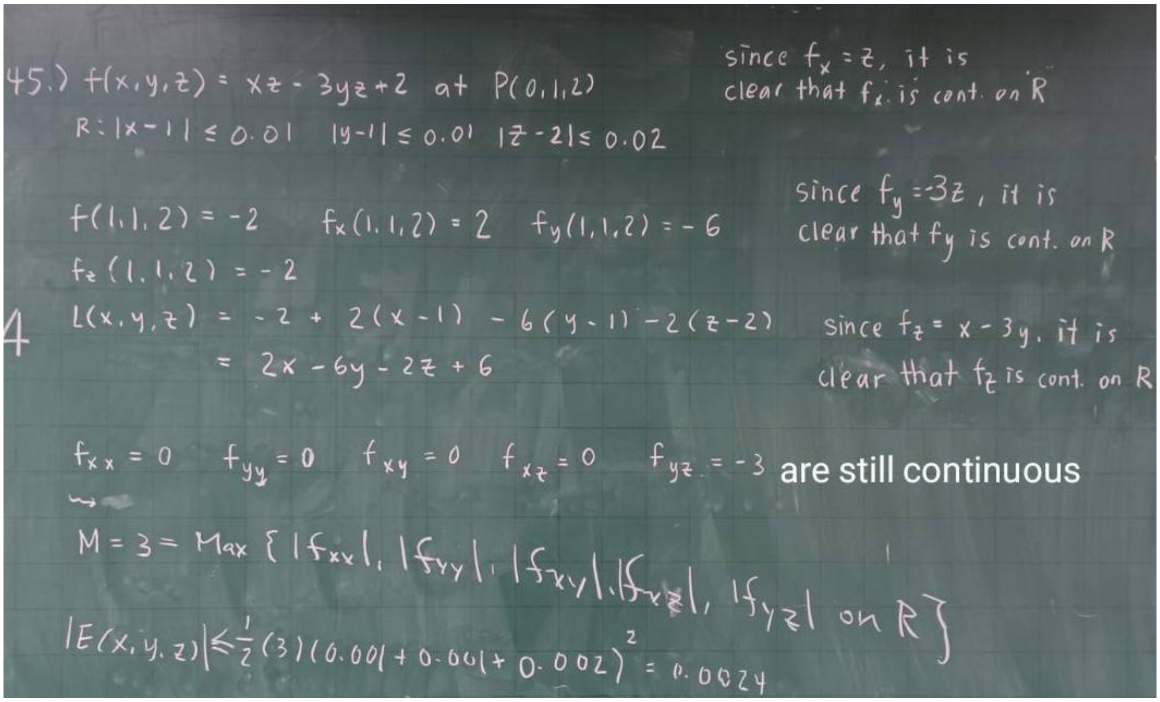

Figure 3: Solution to Section 14.6, problem 45

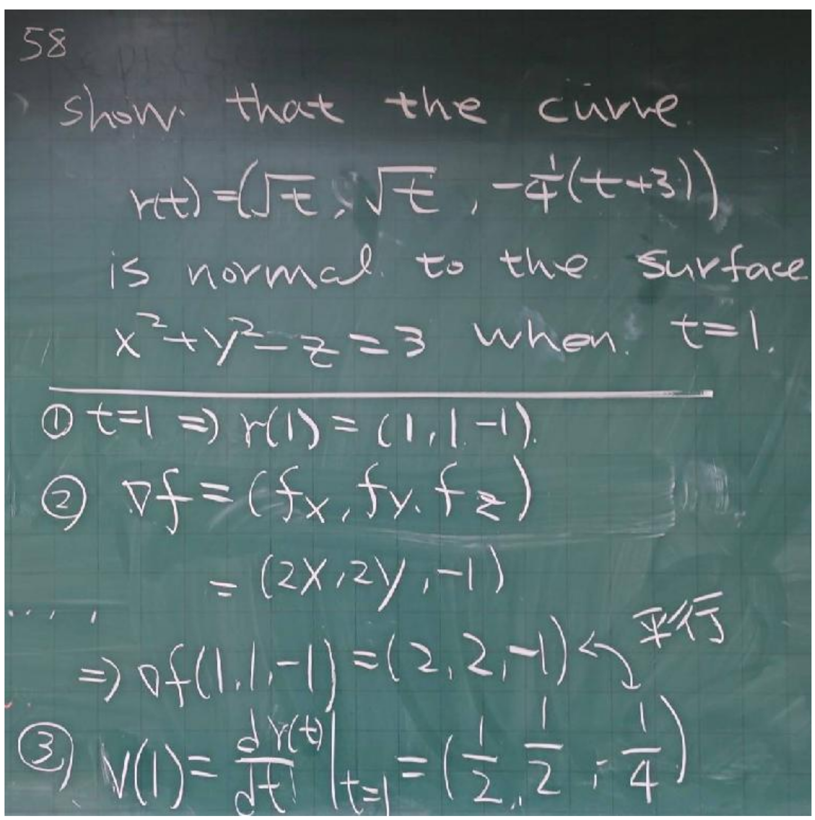

Figure 4: Solution to Section 14.6, problem 58

2. Section 14.7: Solutions, common mistakes and corrections:

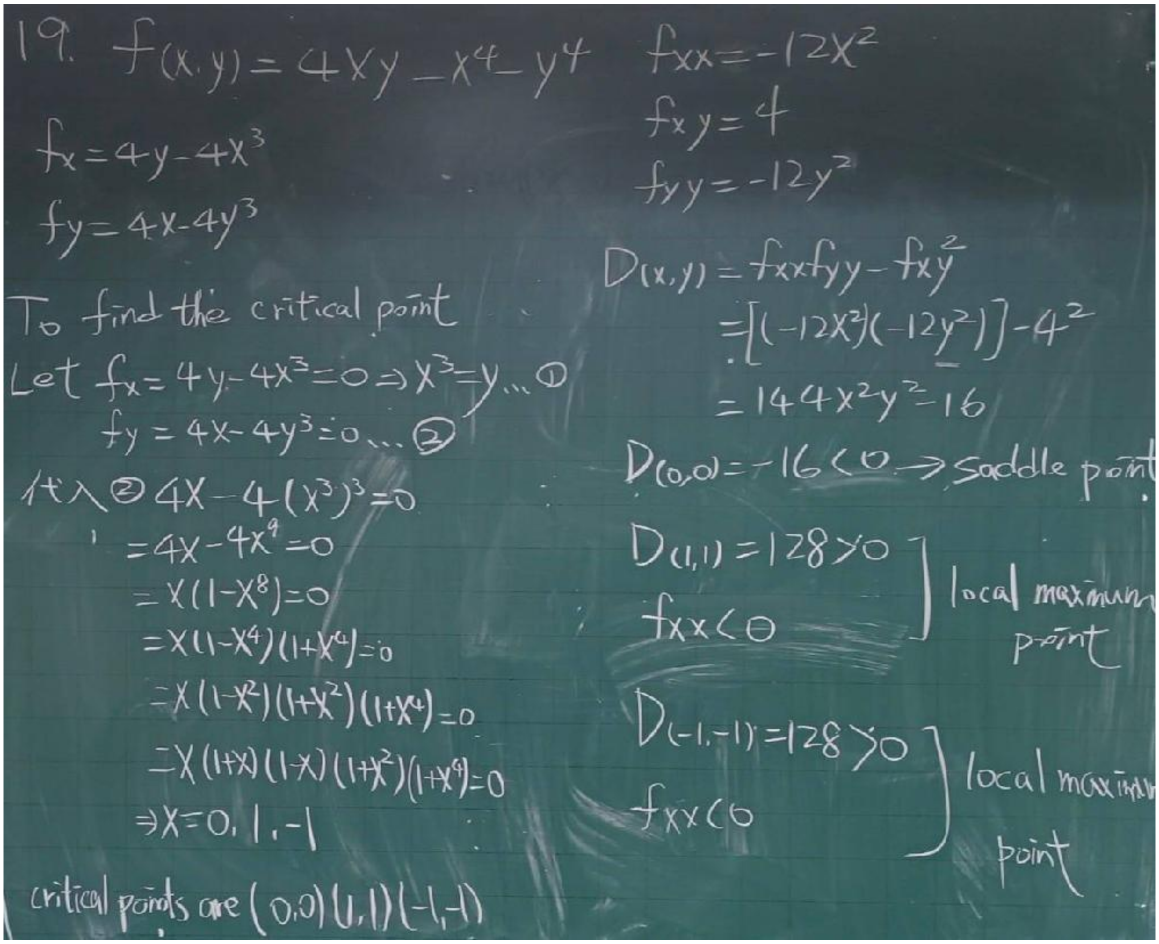

Figure 5: Solution to Section 14.7, problem 19

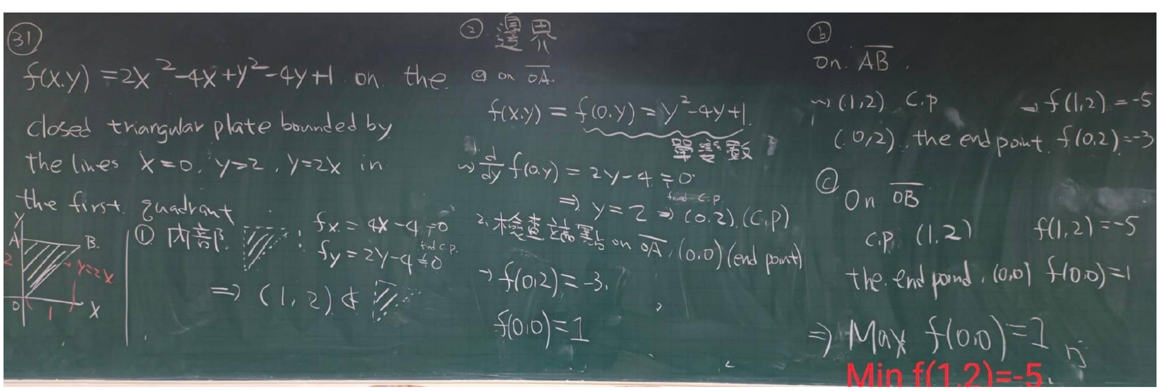

Figure 6: Solution to Section 14.7, problem 31

Remark: Try gradient analysis (plot ∇f in the region and its tangential component on the boundary), it should be easier to get the conclusion.

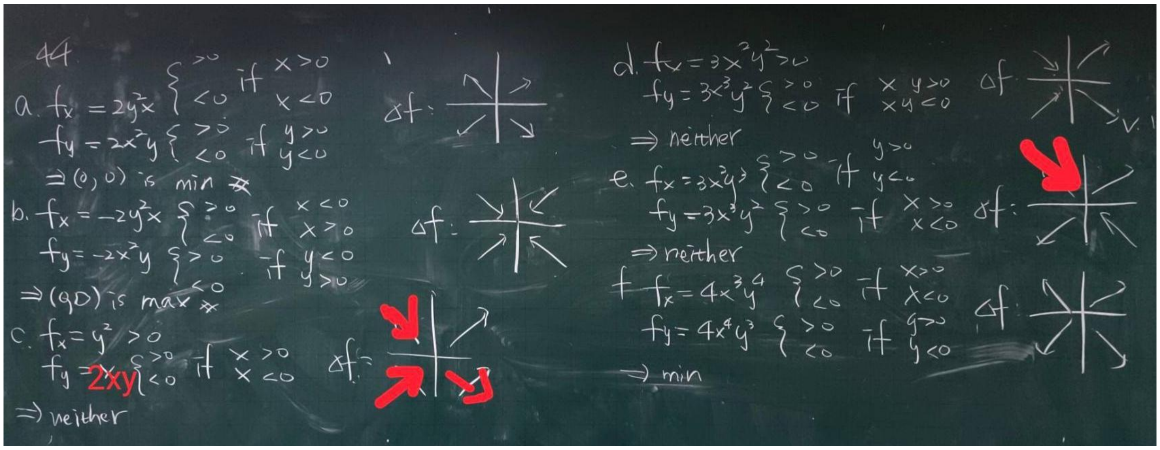

Figure 7: Solution to Section 14.7, problem 44

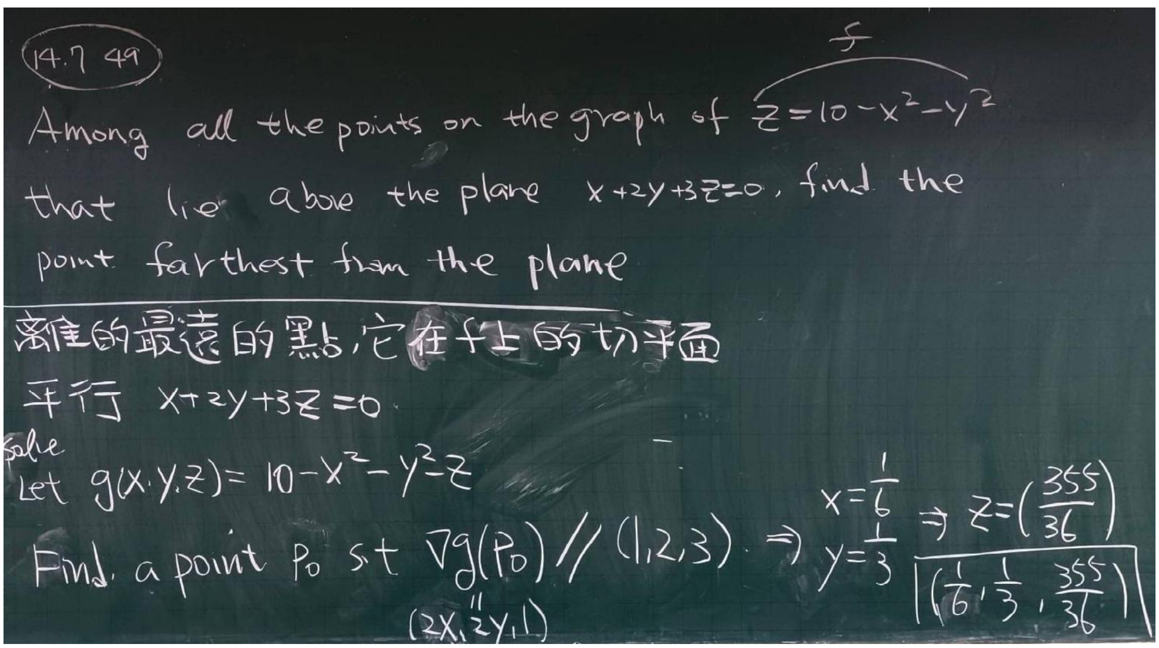

Figure 8: Solution to Section 14.7, problem 49

Remark: Alternative method: Method of Lagrange multiplier (from Section 14.8): Maximize $f(x,y,z) = x+2y+3z$ subject to the constraint $g(x,y,z) = x^2+y^2+z-10 = 0$. That is, find the largest value of $k = f(x,y,z)$ on $g(x,y,z) = 0$. Since the larger k is, the larger the distance between the two planes $f(x,y,z) = 0$ and $f(x,y,z) = k$.

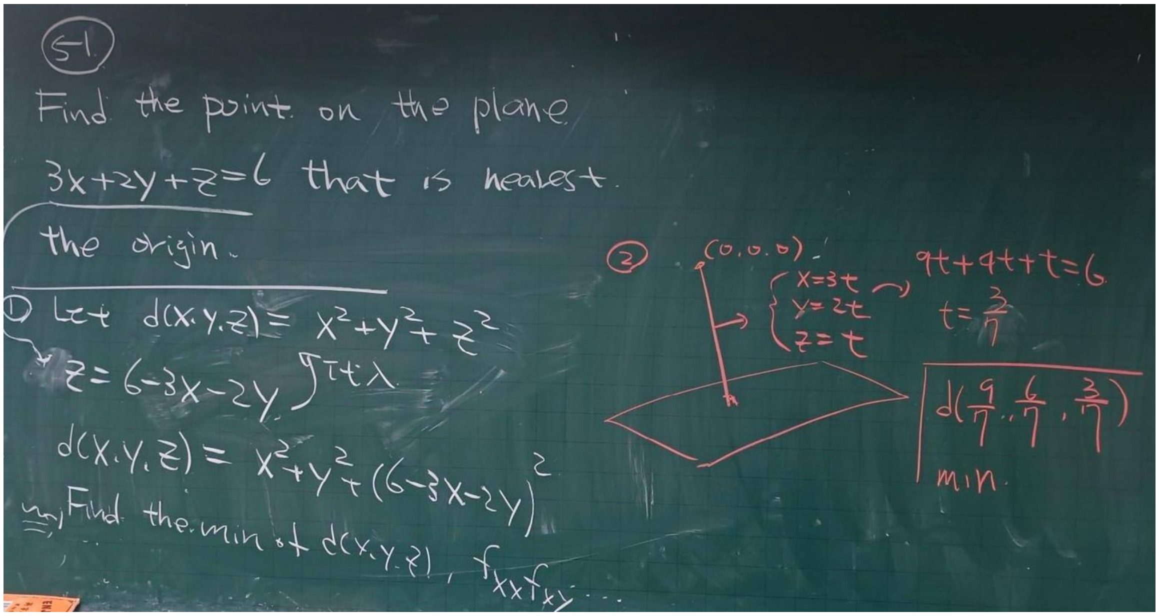

Figure 9: Solution to Section 14.7, problem 51

Remark: Alternative method: Method of Lagrange multiplier (from Section 14.8): Minimize $f(x, y, z) = x^2+y^2+z^2$ subject to the constraint $g(x, y, z) = 3x+2y+z-6 = 0$.