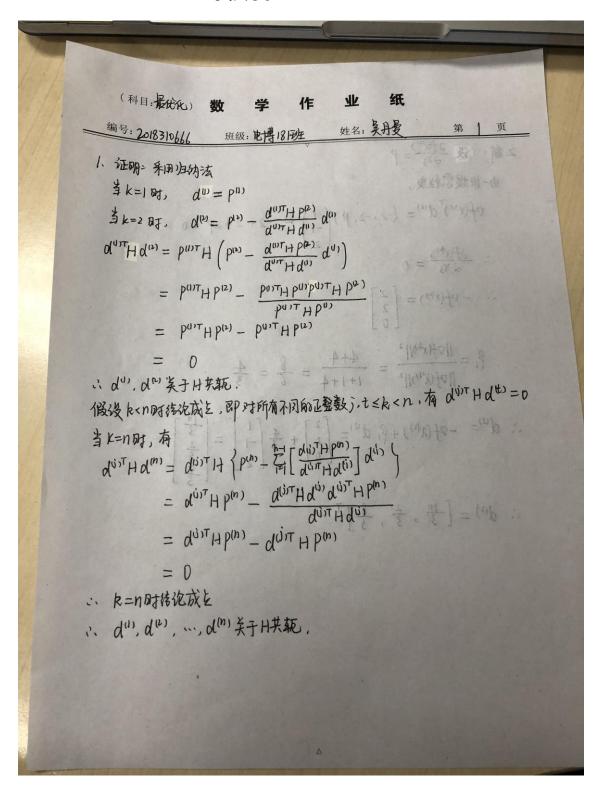
## 最优化第 **12** 次作业 吴丹曼 **2018310666**



2. 设将 FR 共轭梯度法用于有三个变量的函数 f(x),第 1 次迭代,搜索方向  $d^{(1)} = (1, -1, 2)^T$ ,

沿 $d^{(1)}$ 作精确一维搜索,得到点 $x^{(2)}$ ,又设

$$\frac{\partial f(x^{(2)})}{\partial x_1} = -2, \quad \frac{\partial f(x^{(2)})}{\partial x_2} = -2$$

那么按共轭梯度法的规定,从 $x^{(2)}$ 出发的搜索方向是什么?

解:由精确一维搜索的性质,得到  $\nabla f(x^{(2)})^T d^{(1)} = 0$ ,因为

$$\frac{\partial f(x^{(2)})}{\partial x_1} = -2, \quad \frac{\partial f(x^{(2)})}{\partial x_2} = -2$$

所以有 
$$-2 \times 1 + (-2) \times (-1) + \frac{\partial f(x^{(2)})}{x_3} \times 2 = 0 \Rightarrow \frac{\partial f(x^{(2)})}{x_3} = 0$$

接共轭梯度法的规定,  $d^{(2)} = -g_2 + \beta_1 d^{(1)}$ , 而  $\beta_1 = \frac{\parallel g_2 \parallel^2}{\parallel g_1 \parallel^2} = \frac{8}{6} = \frac{4}{3}$ 

所以, 
$$d^{(2)} = -(-2, -2, 0)^T + \frac{4}{3}(1, -1, 2)^T = \left(\frac{10}{3}, \frac{2}{3}, \frac{8}{3}\right)^T$$