Exercise EHL

This exercise studies the lubrication of a circular contact (ball bearing in gear box) under the following conditions ::

Lubricant : $\alpha = 2* 10^{-8}$ Pa^{-1}, $\eta_0= 2*10^{-1}$ Pa.s,
Material : $E'= 2*10^{11}$ Pa,
Geometry : R =0.01 m,
Speed : $u_1+u_2 = 1.0$ m/s
Load : w= 20 N

We start our study by a Hertzian (dry contact) analysis
1)Compute the maximum pressure and contact radius p_h and a.
Ph=0.73GPa, a=1.14e-4m
2) Compute the operating parameters W, U et G.
W=1e-6,U=1e-10,G=4000
3) compute the Moes parameters, indicate the lubrication regime and read the film thickness from the graph, convert the value to microns
M=31.6, L=12.6: piezo-viscous-elastic regime, H_c=4.5, h_c=0.45 micrometer
In the next part the circular contact is approximated by a line contact (a=b).
4) choose w_1 such that the line contact and circular contact operate under the same (piezovoscous) lubrication conditions.
a=b=0.114 mm, p_h identique! p_h=0.73 GPa, **w_1=1.3e5 N/m**
5) what is the total load on the line contact assuming its width to be 2a.
W=29.6N, not much different from the 20N of the circular contact!