Chapter 11 Project

Changed birth year to 2001 because otherwise ellipsoid would be $\frac{z}{0}$

① 12/8/2000

② $\left(\frac{x}{12}\right)^2 + \left(\frac{y}{8}\right)^2 + \left(\frac{z}{|2001-2000|}\right)^2 = 1$

$\underbrace{\left(\frac{x}{12}\right)^2 + \left(\frac{y}{8}\right)^2 + \left(\frac{z}{1}\right)^2}_{g} = \underbrace{1}_{k}$

③ P(12, 8, 2000)

④ $f(x,y,z) = (x-2000)^2 + (y-12)^2 + (z-8)^2$

$g(x,y,z) = \left(\frac{x}{12}\right)^2 + \left(\frac{y}{8}\right)^2 + z^2 \;;\; k = 1$

$\nabla f(x,y,z) = \langle 2(x-2000), 2(y-12), 2(z-8) \rangle$

$\nabla g(x,y,z) = \left\langle \frac{x}{72}, \frac{y}{32}, 2z \right\rangle$

$\lambda \cdot \nabla g = \left\langle \frac{x}{72}\cdot\lambda, \frac{y}{32}\cdot\lambda, 2z\cdot\lambda \right\rangle$

$2(x-2000) = \frac{x}{72}\cdot\lambda$

$2x - 4000 = \frac{x}{72}\cdot\lambda$

$2x - 4000 - \frac{x\lambda}{72} = 0$

$2x - \frac{x\lambda}{72} = 4000$

$x\left(\frac{144-\lambda}{72}\right) = 4000$

$x = \frac{4000}{\left(\frac{144-\lambda}{72}\right)}$

$x = \frac{288000}{144-\lambda}$

$2(y-12) = \frac{y}{32}\cdot\lambda$

$2y - 24 = \frac{y\lambda}{32}$

$2y - 24 - \frac{y\lambda}{4} = 0$

$2y - \frac{y\lambda}{32} = 24$

$y\left(\frac{64-\lambda}{32}\right) = 24$

$y = \frac{32(4)}{64-\lambda}$

$y = \frac{128}{8-\lambda}$

$2(z-8) = 2z\cdot\lambda$

$2z - 16 = 2z\lambda$

$2z - 16 - 2z\lambda = 0$

$2z - 2z\lambda = 16$

$2z(1-\lambda) = 16$

$z(1-\lambda) = 8$

$z = \frac{8}{1-\lambda}$

$$\left[\frac{\left(\frac{288000}{144-\lambda}\right)}{12}\right]^2 + \left[\frac{\left(\frac{128}{8-\lambda}\right)}{8}\right]^2 + \left[\frac{8}{1-\lambda}\right]^2 = 1$$

$$\left[\frac{288000}{144-\lambda}\cdot\frac{1}{12}\right]^2+\left[\frac{128}{8-\lambda}\cdot\frac{1}{8}\right]^2+\left[\frac{64}{(1-\lambda)(1-\lambda)}\right]=1$$

$$\left(\frac{24000}{144-\lambda}\right)^2+\left(\frac{16}{8-\lambda}\right)^2+\left(\frac{64}{1^2-2\lambda+\lambda^2}\right)=1$$

$$\left(\frac{576000000}{\lambda^2-288\lambda+20736}\right)+\left(\frac{256}{\lambda^2-16\lambda+64}\right)+\left(\frac{64}{\lambda^2-2\lambda+1}\right)=1 \quad ????$$

Doesn't work :(I can't do this by hand