3. Gravitation (6 points)

1) Find the free falling acceleration g_0 at the surface of such a spherical planet, which has mass M and material density ρ (in what follows, M and ρ are assumed to be constant).

2) Is it possible that at the surface of a non-spherical planet, there is a point with free falling acceleration $g > g_0$? Motivate your answer.

3) For which planet shape the maximum of the free falling acceleration is achieved? Answer can be given in polar coordinates, the expression can contain one unspecified constant.