Math 114 / Homework # 8

NOTE: All the problems below are from Section 15 of the book *Calculus*, 12th edition, by Thomas et al.

• Before getting started, **read/study** Section 15, especially subsections 6, 7, 8 and make sure that you understand the examples from the relevant sections!

• Work out the **Core Problems** (not necessary to submit them):

  15.6 Moments and Centers of Mass: 1, 4, 6, 9, 13, 29, 30.
  15.7 Triple Integrals in Cylindrical and Spherical Coordinates: 1, 9, 14, 21, 28, 34, 47, 59, 62, 68.
  15.8 Substitutions in Multiple Integrals: 1, 5, 10, 22, 26.

• Work out and submit! the **suggested additional Problems**:

  15.6 Moments and Centers of Mass: 9, 24, 29, 30.
  15.7 Triple Integrals in Cylindrical and Spherical Coordinates: 11, 17, 18, 43, 48, 61, 77, 82.
  15.8 Substitutions in Multiple Integrals: 4, 5, 20, 25, 27,

• Consider the solid inclosed by the four planes defined by the points

  \[ P_0 = (1, 1, 0), \quad P_1 = (2, 1, 1), \quad P_2 = (1, 2, 2), \quad P_3 = (2, 2, 2). \]

  Find the coordinates of the center of mass, provided the density is given by \( \delta(x, y, z) = 1 + xyz \).

**Hint.** Find a change of variables \( (x, y, z) = g(t, u, v) \) s.t. \( g(P_0) = (0, 0, 0), \quad g(P_1) = (1, 0, 0), \quad g(P_2) = (0, 1, 0), \quad g(P_3) = (0, 0, 1) \) of the form \( x = a_1 t + b_1 u + c_1 v \), etc.