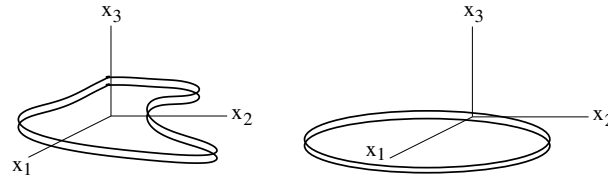


[mex73] Perpendicular-axis theorem

Consider a homogeneous sheet of material which has infinitesimal thickness dx_3 and some arbitrary shape in the (x_1, x_2) -plane. (a) Prove the following relation between the moments of inertia for rotations about the coordinate axes: $I_{11} + I_{22} = I_{33}$. (b) Use the parallel-axis and perpendicular-axis theorems to calculate the principal moments of inertia I_{11}, I_{22}, I_{33} of a coin (mass M , radius R) for rotations about the axes of the following coordinate system: The origin is at the rim of the coin. The x_1 -axis is radial toward the center of the coin, the x_2 -axis is tangential to the coin, and the x_3 -axis is perpendicular to the plane of the coin.



Solution: