

Section 8.1. Definitions

Definition. Let A be a region in the xy -plane. Let dA be a differential of area with centroid (x, y) . Define:

1. Moment of inertia about the x -axis: $I_x = \int_A y^2 dA$.

2. Moment of inertia about the y -axis: $I_y = \int_A x^2 dA$.

3. Product of inertia: $I_{xy} = \int_A xy dA$.

4. Polar moment of inertia: $J_0 = \int_A r^2 dA$ where $r^2 = x^2 + y^2$.

Note. Notice $J_0 = I_x + I_y$.

Definition. Define the *radii of gyration*, k_x, k_y, k_0 , as

$$I_x = k_x^2 A, \quad I_y = k_y^2 A, \quad \text{and} \quad J_0 = k_0^2 A.$$

Note. Notice $k_0^2 = k_x^2 + k_y^2$.

Example. Page 394 Number 8.22.