200 7 8.   (a)   Prove that the moment of inertia of a uniform square lamina, of mass m and side $2r$, about an axis through its centre parallel to one of the sides is $\frac{1}{3}mr^2$.

Let M = mass per unit area

mass of element = $M\{2r\,dx\}$

moment of inertia of the element = $M\{2r\,dx\}x^2$ 5

moment of inertia of the lamina = $M\,2r\int_{-r}^{r}x^2\,dx$ 5

$$= M\,2r\left[\frac{x^3}{3}\right]_{-r}^{r}$$ 5

$$= \tfrac{4}{3}M\,r^4$$

$$= \tfrac{1}{3}m\,r^2$$ 5   20