

$$97. E(T_1^2 + T_2^2)$$

→ draw graph with bounds
to find area

→ Since uniform, pdf = $1/\text{area}$

$$\text{Area} = L^2/2$$

$$f_{T_1, T_2}(t_1, t_2) = 2/L^2$$

$$\int_0^L \int_0^{t_2} (t_1^2 + t_2^2) \cdot \frac{2}{L^2} dt_1 dt_2$$

$$\frac{2}{L^2} \int_0^L \int_0^{t_2} (t_1^2 + t_2^2) dt_1 dt_2$$

$$\frac{2}{L^2} \int_0^L \left[\frac{t_1^3}{3} + t_2^2 \cdot t_1 \Big|_0^{t_2} \right] dt_2$$

$$\frac{2}{L^2} \int_0^L \left(\frac{t_2^3}{3} + t_2^3 \right) dt_2$$

$$\frac{2}{L^2} \int_0^L \frac{4t_2^3}{3} dt_2$$

$$= \frac{2}{L^2} \left[\frac{4t_2^4}{4 \cdot 3} \Big|_0^L \right] = \frac{2L^2}{3} \boxed{C}$$

