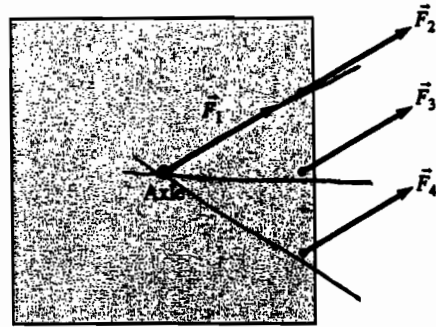


Optional

13.5 Rotation About a Fixed Axis

22. A square plate can rotate about an axle through its center. Four forces of equal magnitude are applied to different points on the plate. The forces turn as the plate rotates, maintaining the same orientation with respect to the plate. Rank in order, from largest to smallest, the angular accelerations α_1 to α_4 .



Order: $\alpha_4 > \alpha_3 > \alpha_2 > \alpha_1$

Explanation:

The forces are equal. τ_1 is zero because it has a radius of zero away from the axle. τ_2 is zero because it has an angle of 0° with respect to the radius extending from the axle to F_2 . τ_4 is greater than τ_3 because the radius of F_4 to the axle and the angle of F_4 with respect to that radius are both greater than the radius of F_3 and the angle of F_3 with respect to that radius. The mass of the plate is constant, so the order of α corresponds to the order of τ .

Excellent!