10. The torque is given by the product of the force times the lever arm. The force is tangent to the disk, so it is perpendicular to the radius of the disk. This means the lever arm is the radius, so we may write

$$\tau = F r$$

$$\tau = (5.0 \text{ N}) (0.8 \text{ m}) = 4.0 \text{ N m}$$

Newton's Second Law for Rotational Motion gives the relationship between torque, angular acceleration, and moment of inertia, but the moment of inertia for the disk is not given in the supplied data. We can calculate it using the expression for the moment of inertia of a disk given in terms of its mass and radius as given in Figure 8-15 on page 143 in the text as

$$I = 1/2 \ m r^2$$

$$I = (1 /2) (3 \text{ kg}) (0.8 \text{ m})^2 = 0.96 \text{ kg m}^2$$

Now we can use Newton's Second Law for Rotational Motion

$$\tau = I \alpha$$

Dividing both sides of the equation by I gives an expression for α

$$\alpha = \tau / I = (4.0 \text{ N m}) / (0.96 \text{ kg m}^2)$$

$$\alpha = 4.17 \ (\text{m kg m} / \text{s}^2) / (\text{kg m}^2) = 4.17 \text{ rad} / \text{s}^2$$