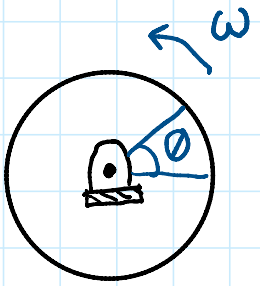
20-R-KM-DK-3

July 31, 2020 11:23 AM

20-R-KM-DK-3 Intermediate Rotation About a Fixed Axis



A disk spins with an angular velocity of ***omega = 16/6 theta^2***. The disk starts at ***theta = 2 rad***. Determine the time needed for the angular velocity of the disk to reach ***omega = 600 rad/s***.

$\omega = \frac{16}{6}\theta^2 \qquad \frac{d\theta}{dt} = \frac{16}{6}\theta^2 \qquad \frac{6}{16}\frac{d\theta}{\theta^2} = dt$

$\frac{6}{16}\int_2^a \frac{d\theta}{\theta^2} = \int_0^t dt \qquad \frac{6}{16}\left(-\frac{1}{\theta}\right)\Big|_2^a = t \qquad \frac{6}{16}\left(-\frac{1}{a}+\frac{1}{2}\right) = t$

$\omega = 600 = \frac{16}{6}a^2 \qquad a = 15 \qquad \frac{6}{16}\left(-\frac{1}{15}+\frac{1}{2}\right) = t \qquad \boxed{t = 0.1625\,s}$