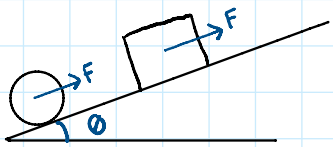
20-R-WE-DK-22

July 30, 2020 10:54 AM

20-R-WE-DK-22 Intermediate Work

Inspiration: None

What is the work done by all forces to drag a box up an incline of ***20 degrees***? What is the work done by all forces to roll a similar-sized cylinder up the same incline? Take the height of the box and the diameter of the cylinder to be equivalent at ***0.5 m***. Both have a mass of ***5 kg***. The cylinder rolls without slipping and the box does not tip. Take the coefficients of friction to be ***mu_s = 0.3*** and ***mu_k = 0.2*** respectively. In both scenarios, a force of ***30 N*** is applied at the object's center of gravity and the objects travel a distance of ***2 m*** up the incline.



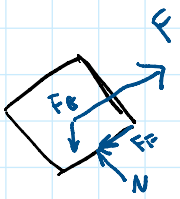
$\Sigma F_y : N - mg\cos\theta = 0 \qquad N = (5)(9.41)\cos 20 = 46.09162305$

$U_N = 0$

$U_G = -mg\sin\theta \cdot s = -(5)(9.41)\sin 20(2) = -33.55217606$

$U_F = F \cdot s = 30(2) = 60$

$U_{FF} = -F_F \cdot s = -0.2N(2) = -18.43671922$



$U_G = -mg\sin\theta \cdot s = -33.55217606$

$U_F = F \cdot s = 30(2) = 60$

U_{FF} sliding $= 0$ No distance travelled as it is rolling U_{FF} rot also $= 0$

$U_N = 0$