THIRD MIDTERM

A block of mass \( m = 1.80 \text{ kg} \) is pulled at constant speed down the plane as shown. The coefficients of friction are: \( \mu_s = 0.75 \) and \( \mu_k = 0.55 \).

(a) Calculate the numerical value of \( P \).
(b) Find the work done by \( P \) to move the block 2.50 m along the plane.
(c) Determine the work done by gravity when the block moves 2.50 m along the plane.
(d) Calculate the work done by friction when the block moves 2.50 m along the plane.

\[
P \cos 30 + mg \sin 20 - f_k = 0 \quad \text{[Constant Speed]}
\]

\[
N + P \sin 30 = mg \cos 20
\]

\[
f_k = \mu_k N
\]

\[
P = \frac{\mu_k mg \cos 20 - mg \sin 20}{\cos 30 + \mu_k \sin 30}
\]

\[
P = 2.70 \text{ N}
\]