At your favorite amusement park you watch a live action stunt where a stuntman of mass \( m \), is sliding on skis \((\mu_k)\) towards a brick wall at a speed \( v \). His jetpack provides a horizontal thrust \( F_{th} \), and wind of force \( F_w \), is blowing against him at an angle \( \theta \) from the horizontal. He slides perfectly to rest right at the wall a distance \( d \) from his current location.

(a) Symbolically apply the work energy theorem to the stuntman sliding to rest in terms of the variables given in the problem and the acceleration of gravity \( g \).

\[
\sum E_i + W = \sum E_f \quad 1 \text{ pt.}
\]

\[
W = \sum \vec{F} \cdot \vec{d} = \sum F_x \cdot d \cdot \cos(\theta) \quad 1 \text{ pt.}
\]

\[
W_w = F_w \Delta r \cos(180 - \theta_w) = F_w \Delta r \cos(180 - 40) = -F_w \Delta r \cos(40) \quad 1 \text{ pt.}
\]

\[
W_{th} = F_{th} \Delta r_{th} \cos(\theta_{th}) = F_{th} \Delta r_{th} \cos(0) \quad 1 \text{ pt.}
\]

\[
W_f = F_f \Delta r \cos(\theta_f) = F_n \mu_k \Delta r_f \cos(180) \quad 2 \text{ pt. (including 1pt for FBD)}
\]

\[
\sum E_i = KE_i + U_i = \frac{1}{2}mv_i^2 + 0 \quad 1 \text{ pt.}
\]

\[
\sum E_f = KE_f + U_f = 0 + 0 \quad 1 \text{ pt.}
\]

\[
\frac{1}{2}mv_i^2 + \left[ F_{th} - ((mg + F_w \sin(\theta))\mu_k + F_w \cos(\theta)) \right] d = 0 \quad 1 \text{ pt.}
\]

(b) If the following values are used, what is the distance to the wall? \( m = 100 \text{ kg}, \mu_k = 0.2, v = 10 \text{ m/s}, F_{th} = 67.6 \text{ N}, F_w = 5 \text{ N}, \theta = 40 \)

\[
\frac{1}{2}mv_i^2 + \left[ F_{th} - ((mg + F_w \sin(\theta))\mu_k + F_w \cos(\theta)) \right] d = 0 \quad 1 \text{ pt.}
\]

\[
\left[ F_{th} - ((mg + F_w \sin(\theta))\mu_k + F_w \cos(\theta)) \right] d = -\frac{1}{2}mv_i^2 \quad 1 \text{ pt.}
\]

\[
d = \frac{-\frac{1}{2}mv_i^2}{F_{th} - ((mg + F_w \sin(\theta))\mu_k + F_w \cos(\theta))} = \frac{-\frac{1}{2}(100 \cdot (9.8 + 5 \cdot \sin(40)))}{67.6 - ((100 \cdot 9.8 + 5 \cdot \sin(40)) \cdot 2 + 5 \cdot \cos(40))} = 37.62 \text{ m} \quad 2 \text{ pt.}
\]