## Homework H4.U

Given: Particle P (having a mass of $m$ ) is released on a rough incline (coefficient of kinetic friction of $\mu_{k}$ ) at $x=0$ with a downward speed of $v$.

Find: You are asked to determine the speed of the block at it has moved a distance of $d$ down the incline.
(a) Draw a free body diagram (FBD) of P .
(b) Write down Newton's second law for P in terms of its $x$-coordinate.
(c) Note that through the chain rule, you can write: $a=\ddot{x}=(d v / d x)(d x / d t)=v(d v / d x)$. Substitute this expression for $a$ into your result from (a) above.
(d) Use separation of variables and integration to determine the speed $v$ of the block in terms of $x$. Substitute in the numerical values for the parameters to determine the speed at $x=d$.


Leave your answers in terms of, at most: $m=2 \mathrm{~kg}, v=25 \mathrm{~m} / \mathrm{s}, \theta=53.13^{\circ}, d=3 \mathrm{~m}$ and $\mu_{k}=0.1$.

