Worksheet forces and friction solutions

**I.** Solve each equation for B algebraically.

1. $R=3KB$ 2. $F\frac{K}{B}=2W$ 3. $ZK^{2}=R+B$ 4. $\frac{K}{Q}+L=3(BX)^{4}$ 5. $\frac{B}{K}-D=H$

 $1.B=\frac{R}{3K}$ $2.B=\frac{FK}{2W}$ $3.B=zK^{2}-R$ $4.B=\frac{\sqrt[4]{\frac{K+QL}{3Q}}}{X}$ $5.B=K\left(H+D\right)$

**II.** Solve each equation trigonometrically for the component vector in terms of the angle and vector.

1. 2. 3. 4.

$1.A\_{x}=A\cos(θ)$ $2.B\_{y}=B\sin(θ)$ $3.C\_{x}=C\sin(θ)$ 4. $D\_{y}=D\cos(θ)$

**III.** Draw a free body diagram for the forces acting on the piano for each of these situations.

1.  2. 3.

  

**IV.** Write a mathematical equation for the sum of the forces in x and y directions for each of these free-body diagrams in terms of the declared variables.

1.2.3.4.

$1. ΣF\_{x}=ma\_{x}=-f\_{k}$ $2. ΣF\_{x}=ma\_{x}=F\_{N}\cos(θ+f\_{s}\cos(α))$

$ΣF\_{y}=ma\_{y}=F\_{N}-F\_{g}$ $ΣF\_{y}=ma\_{y}=F\_{N}\sin(θ)-f\_{s}\sin(α)-F\_{g}$

 $3. ΣF\_{x}=ma\_{x}=f\_{s}-F\_{a}\cos(θ)$ $4. ΣF\_{x}=ma\_{x}=f\_{k}\cos(θ)-F\_{N}\sin(θ-F\_{a}\sin(α))$

$ΣF\_{y}=ma\_{y}=F\_{N}-F\_{a}\sin(θ)-F\_{g}$ $ΣF\_{y}=ma\_{y}=F\_{N}\cos(θ)+f\_{k}\sin(θ)-F\_{a}\cos(α)-F\_{g}$

Note: In situation 4., the angle between the positive x axis and the kinetic friction is equal to θ, which is what I used. You could have however used the angle between the positive y axis and the kinetic friction which is equal to 90 - θ.