```
(%i1) kill(all)$
```

Mw mass of two rear wheels
Ff horizontal friction reaction force of floor on bottom of rear wheels (sum of both forces)
Fa horizontal component of reaction force of rear wheels on vehicle (sum of force at each rear wheel)
a linear horizontal acceleration of vehicle
T torque exerted on rear wheels by motor(s) (sum of both)
I moment of inertia of rear wheels (sum of both)
r radius of rear wheels
Mv total mass of vehicle (including wheels)
g acceleration due to gravity
b horizontal distance from rear wheel axis to Center of Mass (of vehicle minus rear wheels)
h vertical distance from floor to Center of Mass (of vehicle minus rear wheels)
alpha: angular acceleration of each rear wheel

Set up equations when front wheels are just lifting off the ground:

linear horizontal acceleration of rear wheels:

```
(%i1) q1: Ff-Fa=Mw*a;
```

(%o1) $Ff-Fa=a\,Mw$

angular acceleration of rear wheels:

```
(%i2) q2: T-Ff*r=I*alpha;
```

(%o2) $T-Ff\,r=\alpha\,I$

linear horizontal acceleration of vehicle:

```
(%i3) q3: Fa=(Mv-Mw)*a;
```

(%o3) $Fa=a\,(Mv-Mw)$

vehicle flipping torque:

```
(%i4) q4: T=(Mv-Mw)*g*b-Fa*(h-r);
```

(%o4) $T=b\,g\,(Mv-Mw)-Fa\,(h-r)$

relation between angular and linear acceleration:

```
(%i5) q5: alpha = a/r;
```

(%o5) $\alpha=\frac{a}{r}$

There are now 5 equations (q1, q2a, q3, q4, and q5) in 5 unknowns (Ff, Fa, T, a, and alpha)

```
(%i6) sol: solve([q1,q2,q3,q4,q5],[Ff,Fa,T,a,alpha])[1]$
      sol[4];
      simp: false$ a = (b*g*r*(Mv-Mw))/((I+Mw*r^2)+(Mv-Mw)*h*r); simp: true$
```

(%o7) $a=-\frac{b\,g\,Mw\,r-b\,g\,Mv\,r}{I+Mw\,(r^2-h\,r)+h\,Mv\,r}$

(%o9) $a=\frac{b\,g\,r\,(Mv-Mw)}{I+Mw\,r^2+(Mv-Mw)\,h\,r}$

look what happens when you ignore wheel mass (and thus wheel inertia too):

```
(%i11) subst([I=0,Mw=0],sol[4]);
```

(%o11) $a=\frac{b\,g}{h}$