

5/20/2011

tau is torque on each of 4 wheels;

Mv is vehicle mass;

Mw is mass of one wheel;

I is moment of inertia of wheel;

r is radius of wheel;

F1 is force exerted by one wheel on vehicle (and vice versa);

F2 is reaction force of floor on one wheel;

alpha is angular acceleration of wheel;

a is acceleration of vehicle.

```
(%i1) kill(all)$
      eqs: [F1=(Mv/4)*a, F2-F1=Mw*a, tau-r*F2=I*alpha, alpha*r=a]$
      eqs[1];
      eqs[2];
      eqs[3];
      eqs[4];
      ans: solve (eqs, [F1,F2,alpha,a])[1]$
      ans[1];
      ans[2];
      ans[3];
      ans[4];
```

$$(\%02) \quad F1 = \frac{a Mv}{4}$$

$$(\%03) \quad F2 - F1 = a Mw$$

$$(\%04) \quad \tau - r F2 = \alpha I$$

$$(\%05) \quad \alpha r = a$$

$$(\%07) \quad F1 = \frac{Mv r \tau}{4 I + 4 Mw r^2 + Mv r^2}$$

$$(\%08) \quad F2 = \frac{4 Mw r \tau + Mv r \tau}{4 I + 4 Mw r^2 + Mv r^2}$$

$$(\%09) \quad \alpha = \frac{4 \tau}{4 I + 4 Mw r^2 + Mv r^2}$$

$$(\%010) \quad a = \frac{4 r \tau}{4 I + 4 Mw r^2 + Mv r^2}$$