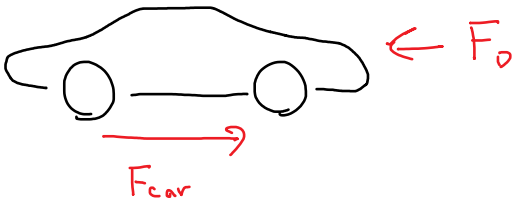
Problem 3

The drag force of air on a car is equal to...

$$F_d = \frac{1}{2}\rho v^2 c_d A$$

where ρ is the density of the air, v is the velocity, c_d is the drag coefficient, and A is the frontal area. If a Mazda RX7 has a drag coefficient of .29, a frontal area of 5.95 square feet, and a max power output of 146 hp, and the density of air is .002326 slug/ft3 what is the theoretical top speed of the Mazda assuming it only has to fight wind resistance?



at top speed $a = 0$

$F_{car} = F_d$

$P = (146)(550)\frac{ft\,lbs}{s} = (\vec{F}_d)(V)$

$\frac{1}{2}(.002326\frac{slug}{ft^3})(V^2)(.29)(5.95\,ft^2)$

$4.001 \times 10^7 = V^3$

$V = 342\ ft/s = 233.1\ mph$

obviously other things are limiting top speed in addition to wind resistance