5.37

$m = 2.0\,kg$

a) Particle's acceleration?

$$F_{net} = ma$$
$$a = \frac{F_{net}}{m}$$
$$= \frac{18\ N}{2\ kg} = \boxed{9.0\ m/s^2} \rightarrow$$

b) If $v_i = 0$, how far does it travel in 5.0s?

$v_i = 0$
$a = 9.0\ m/s^2$
$\Delta t = 5.0\ s$
$\Delta x = ?$

$$\Delta x = v_i t + \frac{1}{2} a t^2$$
$$= 0t + \frac{1}{2}(9.0)(5)^2$$
$$= \boxed{113\ m} \rightarrow$$

5.41

F_g on moon = 250N,
F_g on earth = ?

Checking references (textbook, online), $a_{moon} = 1.67 m/s^2$.

So... $F_g(moon) = m a_{moon}$

$250N = m(1.67 m/s^2)$

b) $m_{astronaut\ \&\ suit} = \frac{250}{1.67} = \boxed{150\ kg}$

Same mass everywhere: moon, Earth, space, etc.

a) On Earth, $W = mg = F_g$, so

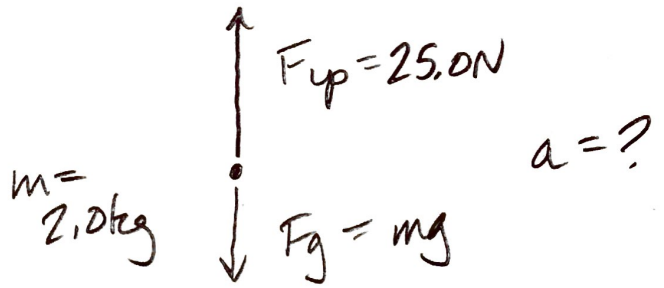
$F_g = (150)(9.8)$

$= \boxed{1470N}$

Converted to pounds?

$150kg \times \frac{2.21\ pounds}{1.00\ kg} = \boxed{332\ pounds}$

5.45



$\Sigma F = ma$, or $F_{net} = ma$

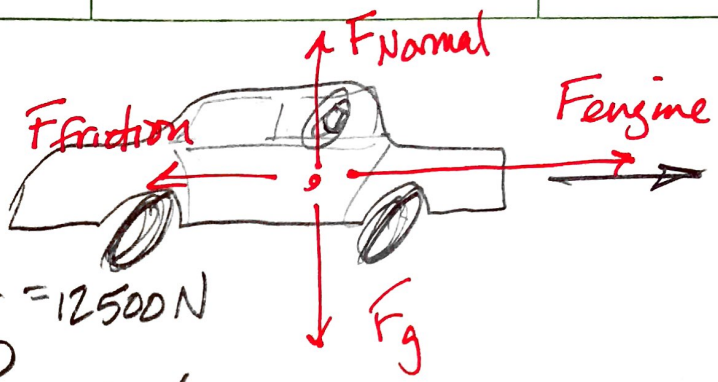
$F_{up} - F_g = ma$

$F_{up} - mg = ma$

$(25\ N) - (2)(9.8) = (2)a$

$a = \boxed{2.7\ m/s^2 \quad up}$

5.46



$F_{g\ car} = 12500\,N$

$v_i = 0$

$v_f = 83.0\ km/h$

$\Delta t = 5.0\,s$

$F_{friction} = 1350\,N$

$F_{engine} = ?$

$\Sigma F = ma$

What is m?

What is a?

$F_{engine} - F_{friction} = ma$

$F_{engine} = ma + F_{friction}$

$F_{engine} = (1276)(4.61) + 1350N$

$F_{engine} = \boxed{7.23e3N}$

$F_g = mg$

$12500N = m(9.8)$

$m = 1276\ kg$

$$a = \frac{v_f - v_i}{\Delta t} = \frac{\left(\frac{83\ km}{h}\right)\left(\frac{1000\ m}{1\ km}\right)\left(\frac{1\ h}{3600\ s}\right) - 0}{5\ s}$$

$$= 4.61\ m/s^2$$