Kinematics + Dynamics Review

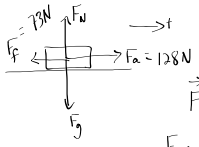
Kinematics —acceleration→ dynamics

$v_1, v_2, a, \Delta t$
Δd

$F_{net} = ma$
↓
sum of all the force.
$\sum \vec{F} = \vec{F_g} + \vec{F_N} + \vec{F_a} + \vec{F_f}$

$F_{net} = F_a - F_f$

16.



$\vec{F}_{net} = m\vec{a}$

$F_a - F_f = ma$

$128N - 73N = m_1(5.0 m/s^2)$

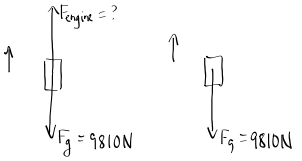
F_{net} 55N $= m_1(5.0 m/s^2)$

$m = 11 kg$

$m_1 = ?$ (wagon)
$a_1 = 5.0 m/s^2$

$m_2 = ?$ (wagon + child)
$a_2 = 1.0 m/s^2$

21.



$v_1 = 0$
$v_2 = ?$
$\Delta d = 1.0 \times 10^3 m$
$a = ?$

$v_1 = ?$
$v_0 = 0$
$\Delta d = 4.0 \times 10^3 m$
$a = -9.8 m/s^2$

a) Find v_1 for when the engine is off.

$v_2^2 = v_1^2 + 2a\Delta d$

$v_1^2 = v_2^2 - 2a\Delta d$

$v_1^2 = 0^2 - 2(-9.8 m/s^2)(4.0 \times 10^3 m)$

$v_1 = 280 m/s$
$(2.8 \times 10^2 m/s)$

c) When the engine was off $a = -9.8 m/s^2$

When the engine was on:

$v_1 = 0$
$v_2 = 2.8 \times 10^2 m/s$
$\Delta d = 1.0 \times 10^3 m$
$a = ?$

$v_2^2 = v_1^2 + 2a\Delta d$

$v_2^2 - v_1^2 = 2a\Delta d$

$a = \frac{v_2^2 - v_1^2}{2\Delta d}$

$a = \frac{(2.8 \times 10^2 m/s)^2 - 0^2}{(2(1.0 \times 10^3 m))}$

$a = 39 m/s^2$

d) $\vec{F}_{net} = m\vec{a}$

$F_{engine} - F_g = ma$

$F_{engine} = ma + F_g$

$F_{engine} = (1.0 \times 10^3 kg)(39 m/s^2) + 98100N$
(F_{net})

$F_{engine} = 39,240N + 9810N$

$F_{engine} = 49050N$

$F_{engine} = 4.9 \times 10^4 N$

19. $v_i = 0\ m/s$

$\Delta t = 3.0\ s$

$\Delta d = 18\ m$

$a = ?$

$F_g(astro) = 710\ N$ (earth)

$F_g(astro) = ?$ (wherever)

find m

$\Delta d = \cancel{v_i \Delta t}^{0} + \frac{1}{2} a(\Delta t)^2$

$\Delta d = \frac{1}{2} a(\Delta t)^2$

$2\Delta d = a(\Delta t)^2$

$a = \frac{2\Delta d}{(\Delta t)^2}$

$a = \frac{2(18\ m)}{9.0\ s^2}$ $(3.0\ s)^2$

$a = 4.0\ m/s^2$