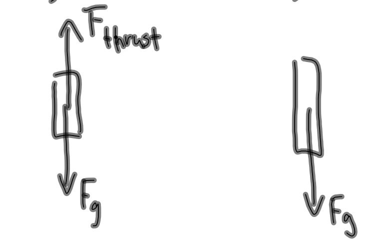
Review

21. a) Engine On Engine Off



b) Engine Off

$\Delta d = 4.0 \times 10^3 m$

$v_1 = ?$

$v_2 = 0$

$a = -9.81 m/s^2$

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

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

$$v_1^2 = -2(-9.81 m/s^2)(4000 m)$$

$$\boxed{v_1 = 2.8 \times 10^2 m/s}$$

c) Engine On:

$v_1 = 0$

$v_2 = 2.8 \times 10^2 m/s$

$\Delta d = 1.0 \times 10^3 m$

$a = ?$

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

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

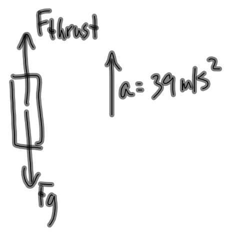
$$a = \frac{v_2^2 - v_1^2}{2\Delta d}$$

$$a = \frac{(2.80 \times 10^2 m/s)^2 - 0^2}{2(1.0 \times 10^3 m)}$$

$$a = 39.24 m/s^2$$

$$\boxed{a \doteq 39 m/s^2}$$

d)



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

$$F_{thrust} - F_g = ma$$

$$F_{thrust} - mg = ma$$

$$F_{thrust} = ma + mg$$

$$F_{thrust} = m(a + g)$$

$$F_{thrust} = 1.0 \times 10^3 kg (39 m/s^2 + 9.81 m/s^2)$$

$$F_{thrust} \doteq 4.9 \times 10^4 N$$

$$\boxed{\vec{F}_{thrust} \doteq 4.9 \times 10^4 N \text{ [up]}}$$

Graphical Analysis of Data

$y \propto x$ (proportionality statement)

$y = kx$ (general equation where k is the proportionality constant)

$y = mx + b$

The graph is linear with a slope of k and a y-int of 0.

Power Curve

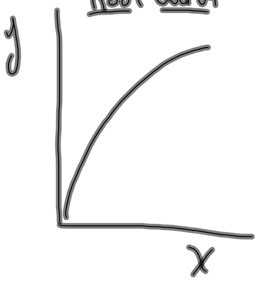
$y \propto x^n$

$y = kx^n$

$y = mx + b$

A plot of y vs x^n will be linear with a slope of k and a y-intercept of zero.

Root Curve



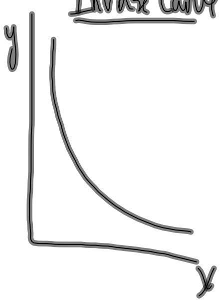
$y \propto \sqrt[n]{x}$

$y = k\sqrt[n]{x}$

$y = mx + b$

A plot of y vs $\sqrt[n]{x}$ will be linear with a slope of k and a y-intercept of zero.

Inverse Curve



$y \propto \frac{1}{x^n}$

$y = k\left(\frac{1}{x^n}\right)$ x^n

$y = mx + b$

A plot of y vs $\frac{1}{x^n}$ will be linear with a slope of k and a y-intercept of zero.