

$$a = -0.8t^2 + 22$$

$$t_e = 5.8 \text{ sec}$$

$$h = 136 \text{ m}$$

$$V_p = -14(1 - e^{-t/8}) = -14 + 14e^{-t/8}$$

1. Engine Burn

unknowns: V, h / $a = -0.8t^2 + 22, t_e = 5.8$

$$V = \int_0^t (-0.8t^2 + 22) dt$$

$$V = \left(-\frac{0.8}{3}t^3 + 22t \right)_0^t$$

$$V = -\frac{4}{15}t^3 + 22t$$

$$V(5.8) = 75.5701333$$

$$h = \int_0^t \left(-\frac{4}{15}t^3 + 22t \right) dt$$

$$h = \left(-\frac{1}{15}t^4 + 11t^2 \right)_0^t$$

$$h = -\frac{1}{15}t^4 + 11t^2$$

$$h(5.8) = 294.596693 \text{ m}$$

2. free fall

unknowns: time.

knowns: $\Delta h = -136 \text{ m}, h_0 = 294.596693, a = -9.8,$

$$V_0 = 75.5701333$$

$$\Delta h = V_0 t + \frac{1}{2} a t^2$$

$$-136 = 75.5701333t - 4.9t^2$$

$$136 + 75.5701333t - 4.9t^2 = 0$$

$$t = -6.2 \text{ or } t = 17.05031 \text{ sec}$$

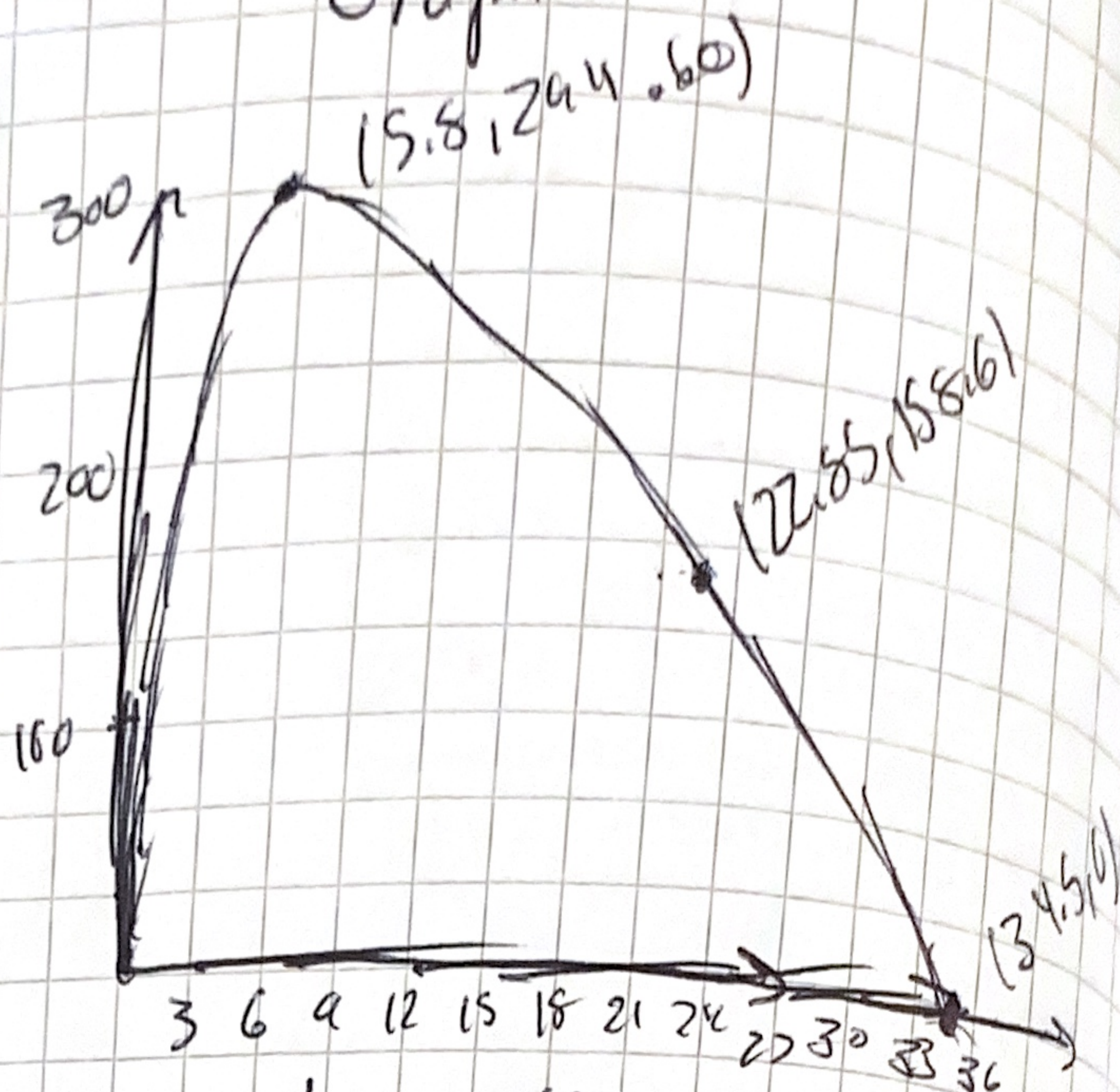
$$h_{\text{new}} = 158.596693$$

$$5.8 + 17.05031 = 22.85031$$

$$38 \Delta X = 401$$

67

Graph



3. parachute

unknown: time parachute

known: $v_p = -14 + 11e^{-t/8}$

$\Delta X = -h_{\text{new}} = -158.596693$

$\Delta X = \int v dt$

$-158.596693 = \int_{22.85031}^{+} (-14 + 11e^{-t/8}) dt$

$-158.596693 = \left[-14t - 112e^{-t/8} \right]_{22.85031}^{+}$

$-158.596693 = -14t - 112e^{-t/8} + 326.342240$

$484.93893 = -14t + 112e^{-t/8}$

$t = 34.53 \text{ seconds}$

total current
22.85031