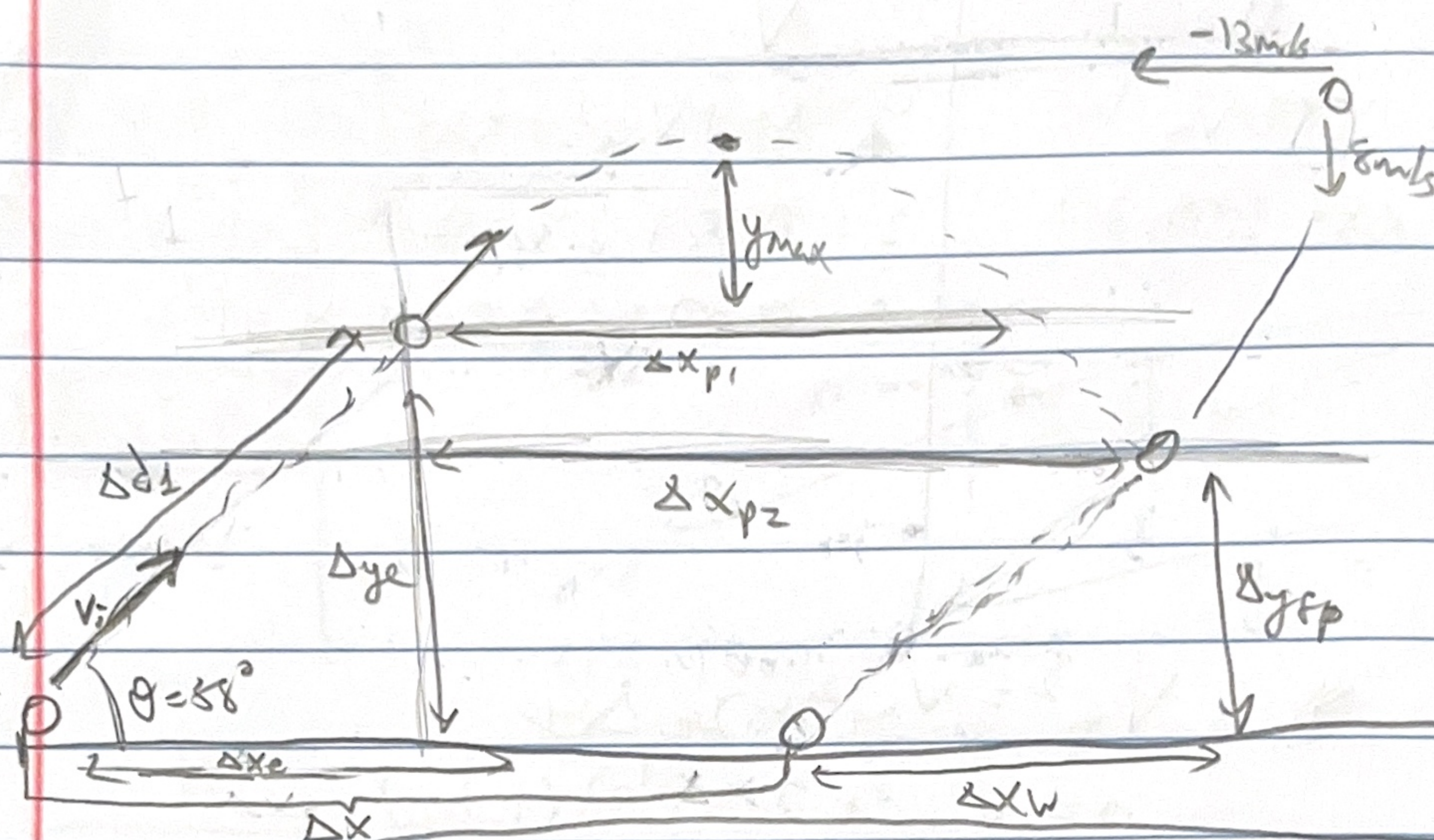
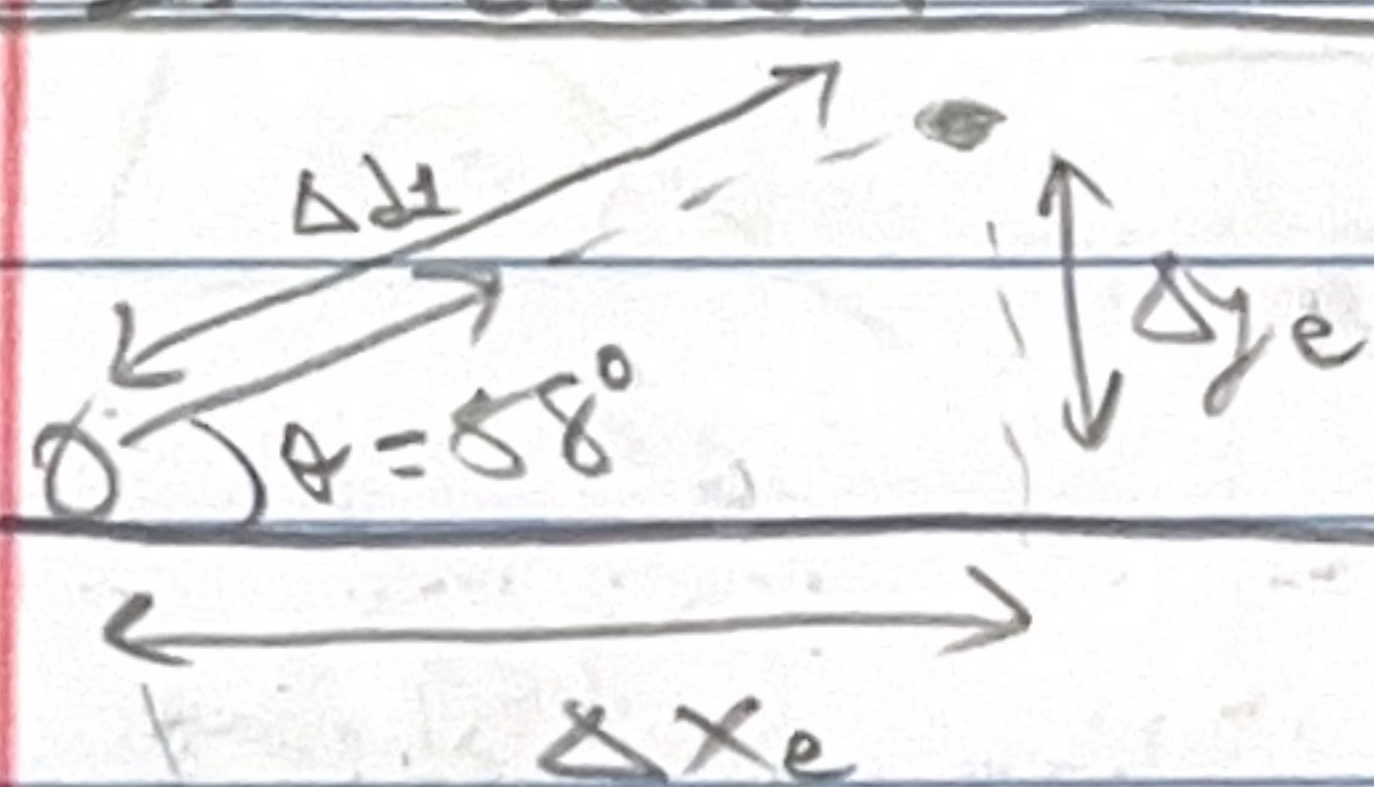


Rocket Problem



1. Acceleration while engine on



$$\Delta d_1 = v_i t + \frac{1}{2} a t^2$$

$$\Delta d_1 = \frac{1}{2} (4.6) (8.1)^2$$

$$\Delta d_1 = 150.903 \text{ m}$$

$$t_e = 8.1 \text{ s}$$

$$\text{Net } a = 4.6 \text{ m/s}^2$$

$$\sin \theta = \frac{\Delta y_e}{\Delta d_1}$$

$$\cos \theta = \frac{\Delta x_e}{\Delta d_1}$$

$$\sin 58^\circ = \frac{\Delta y_e}{150.903}$$

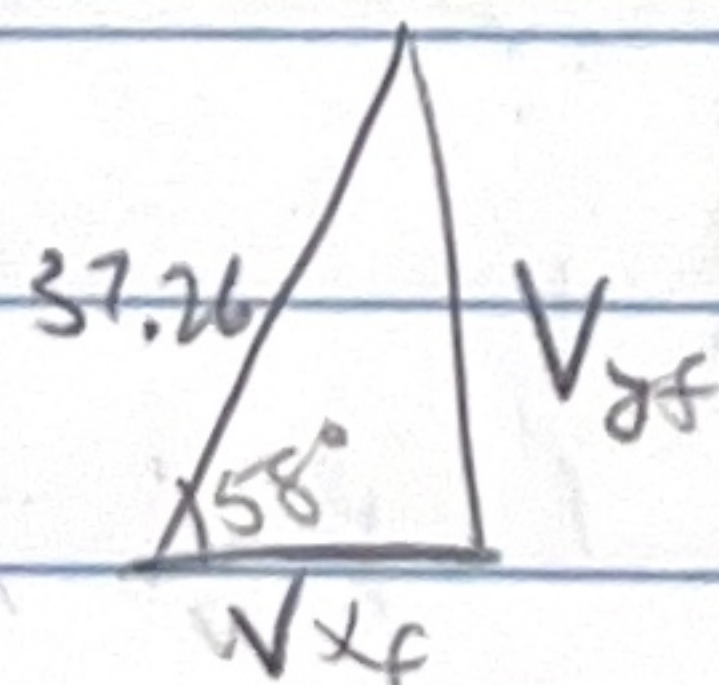
$$\cos 58^\circ = \frac{\Delta x_e}{150.903}$$

$$150.903 \sin 58^\circ = \Delta y_e$$

$$150.903 \cos 58^\circ = \Delta x_e$$

$$\Delta y_e = 127.97 \text{ m}$$

$$\Delta x_e = 79.97 \text{ m}$$



$$V_f = v_i + a t$$

$$V_f = (4.6) (8.1)$$

$$V_f = 37.26 \text{ m/s}$$

$$\sin \theta = \frac{V_{yf}}{V_f}$$

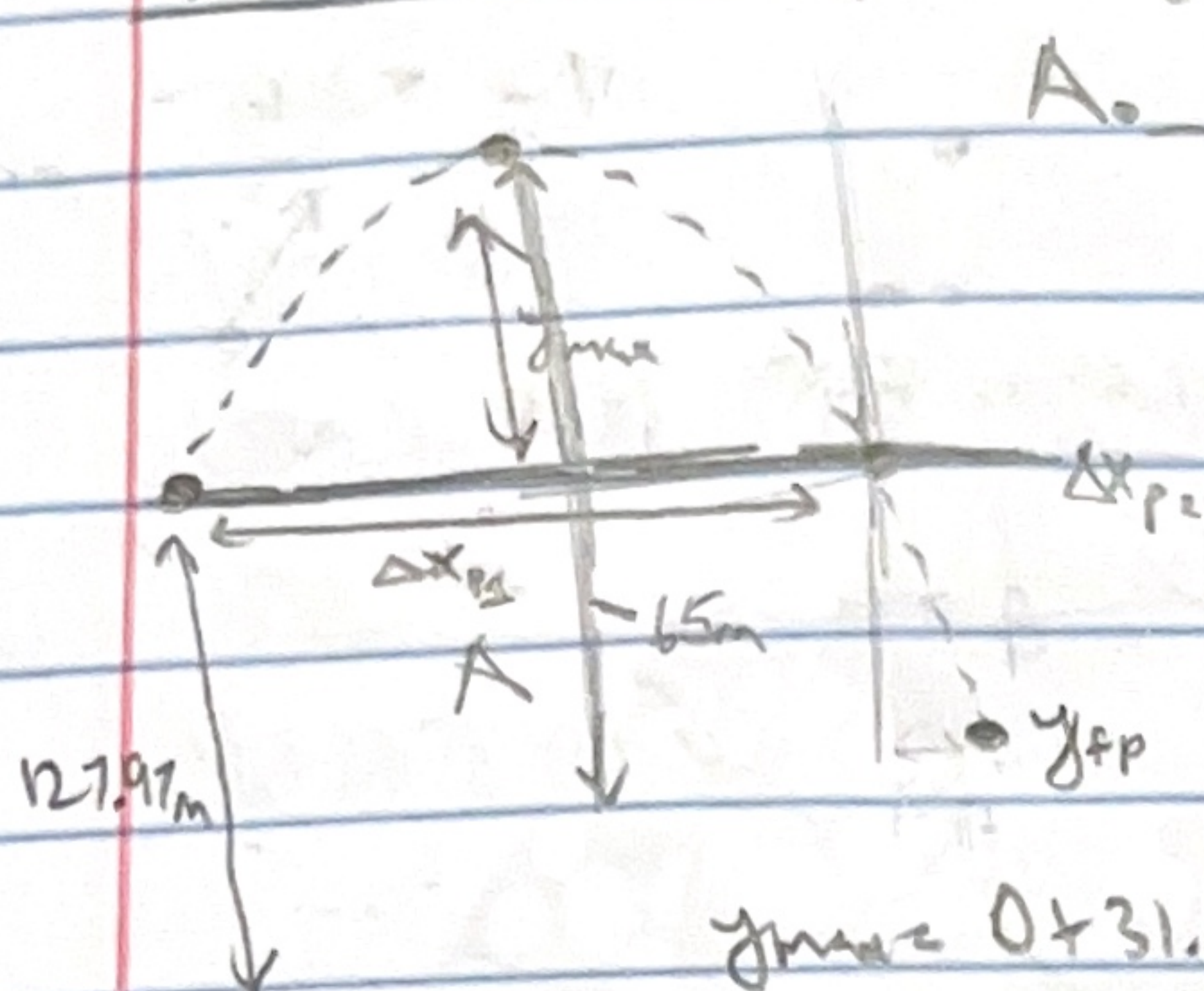
$$\cos 58^\circ = \frac{V_{xf}}{V_f}$$

$$37.26 \sin 58^\circ = V_{yf} \quad 37.26 \cos 58^\circ = V_{xf}$$

$$V_{yf} = 31.60 \text{ m/s}$$

$$V_{xf} = 19.74 \text{ m/s}$$

2. Rocket post-engine



$$\Delta x_{p1} = V_{xf} t_{p1}$$

$$\Delta x_{p1} = 19.74(t_{p1})$$

$$\Delta x_{p1} = 19.74(6.45)$$

$$\Delta x_{p1} = 127.33m$$

$$y = y_0 + V_{yf} t_{p1} - \frac{1}{2} g t_{p1}^2$$

$$0 = 0 + 31.60 t_{p1} - 4.9 t_{p1}^2$$

$$t_{p1} = 6.45s$$

$$\frac{1}{2}(t_{p1}) = 3.22s$$

$$y_{max} = 0 + 31.60(3.22) - 4.9(3.22)^2$$

$$y_{max} = 50.94m$$

B. 65m - y_max

$$= 65 - 50.94 = 14.06m$$

$$y_{fp} = 127.97m - 14.06m$$

$$y_{fp} = 113.91m$$

H

$$\Delta x_{p2} = V_{xf} t_{p2}$$

$$\Delta x_{p2} = 19.74 t_{p2}$$

$$\Delta x_{p2} = 19.74(6.87)$$

$$\Delta x_{p2} = 135.58m$$

V

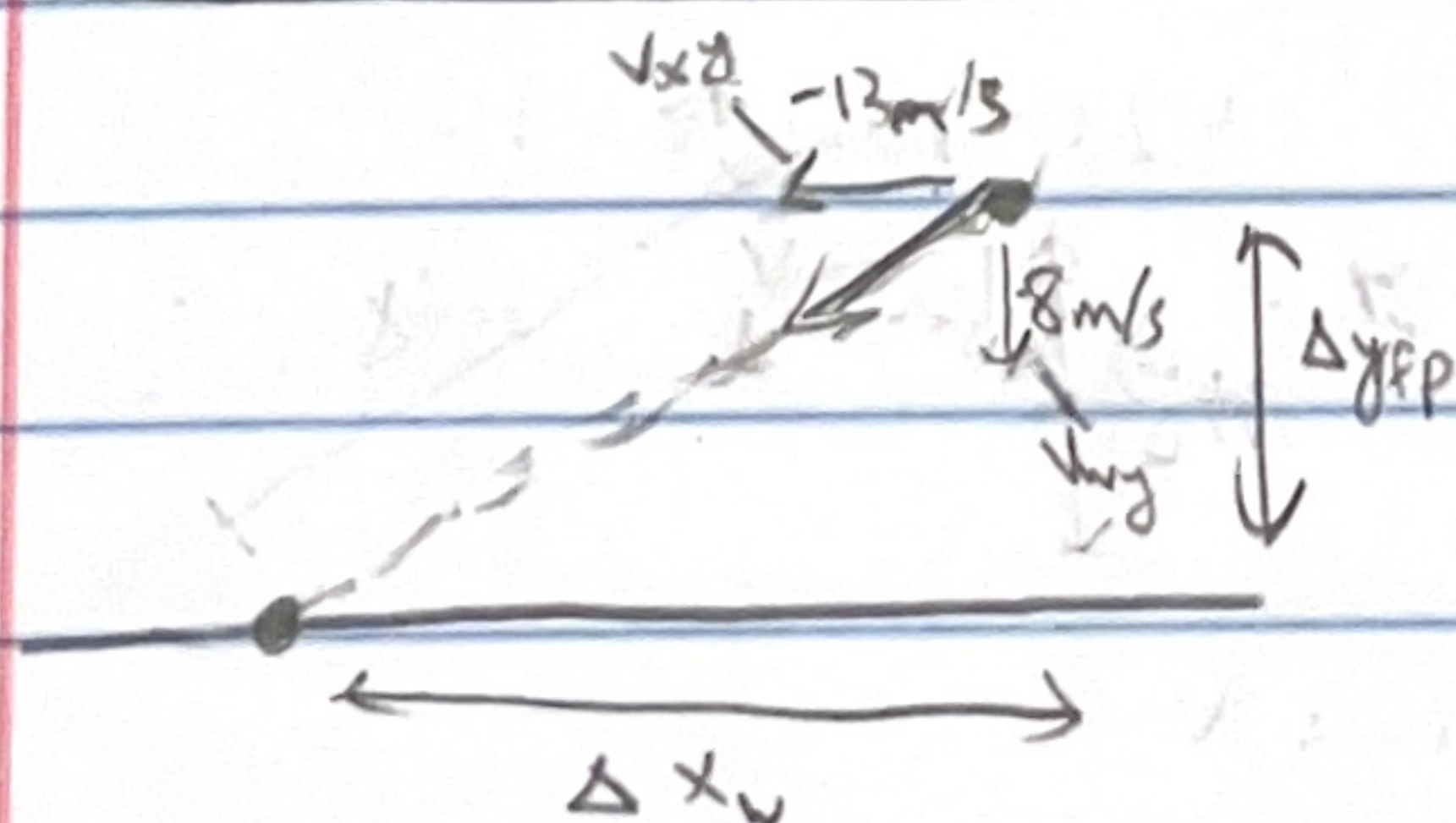
$$y_{fp} = \Delta y_e + V_{yf} t_{p2} - \frac{1}{2} g t_{p2}^2$$

$$113.914 = 127.97 + 31.60 t_{p2} - 4.9 t_{p2}^2$$

$$0 = 14.06 + 31.60 t_{p2} - 4.9 t_{p2}^2$$

$$t_{p2} = 6.87s$$

3. Rocket with Wind



$$\Delta y_{fp} = (V_{wy})(t_w)$$

$$113.914 = (8)(t_w)$$

$$t_w = 14.24s$$

$$\Delta x_w = (V_{wx})(t_w)$$

$$\Delta x_w = (-13)(14.24)$$

$$\Delta x_w = -185.11m$$

$$\text{TOTAL } \Delta x: \Delta x_{p1} + \Delta x_{p2} + \Delta x_w = 127.33 + 135.58 - 185.11 = 30.43m \text{ East}$$