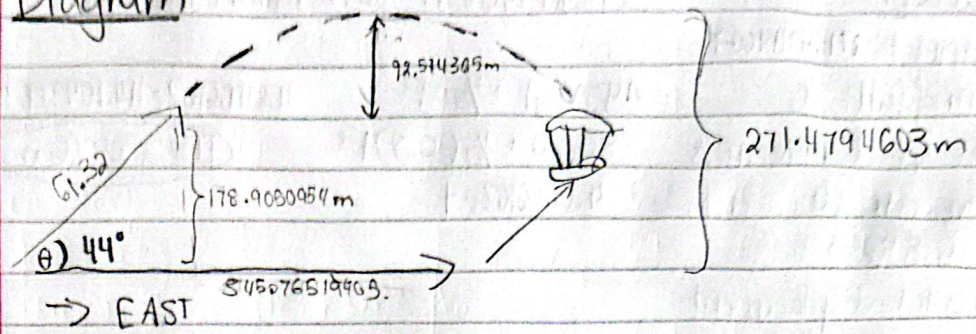
Rocket Problem Pt. 2

Diagram



Engine Burn

Givens: $a = 7.3\ m/s^2$
$t = 8.4s$
$\theta = 44°$
$V_0 = 0$

Finding: horizontal speed
vertical speed
horizontal displacement
vertical displacement

$V_f = V_0 + at$
$V = 0 + (7.3\ m/s^2)(8.4s)$
$V = 61.32$

$V_x = 61.32(\cos 44) = 44.109917\ m/s$
$V_y = 61.32(\sin 44) = 42.59645\ m/s$

$\Delta x = V_0 t + \frac{1}{2}at^2$
$= 0 + \frac{1}{2}(7.3)(8.4)^2$
$= 257.544m$

$\Delta x = 257.544(\cos 44)$
$= 185.2016495m$

$\Delta y = 257.544(\sin 44)$
$= 178.9050954m$

Free Fall to Vertex

Givens: vertical speed: $42.59645\ m/s$
horizontal speed: $44.109917\ m/s$
height after burn: $178.9050954\ m$
$a = -9.8\ m/s^2$
velocity at vertex: 0

Finding: time to reach vertex
Δheight to vertex
horizontal displacement
Total height at vertex

$V = V_0 + at$
$0 = 42.59645 - 9.8t$
$4.34657 = t$

$V^2 = V_0^2 + 2a\Delta y$
$0 = (42.59645)^2 + 2(-9.8)(\Delta y)$
$92.574365 = \Delta y$

$44.109917\ m/s \cdot 4.34657s = 191.72713m$

$178.9050954 + 92.574365 = 271.4794603$

Free Fall Down

Given: max height: 271.4794603
Δy during fall: 80
horizontal speed: 44.109917 m/s
initial velocity: 0
$a = -9.8\ m/s^2$
Finding: horizontal displacement
height after fall

271.47946 03m − 80m = 191.47946 03m

$\Delta y = V_0 t + \frac{1}{2} a t^2$
$80 = 0 + \frac{1}{2}(-9.8) t^2$
$4.0406102_5 = t$

$4.0406102_5 \cdot 44.109917\ m/s$
$= 178.230976\ m$

Parachute

Given: Fall Height: 191.47946 13m
vertical speed: 11 m/s
Wind speed: 12 m/s
Finding: horizontal displacement

$d = vt$
$191.47946 13\ m = 11t$
$17.4\overline{54}5_5 = t$

$17.4\overline{54}5_5 \cdot -12\ m/s$
$= -209.4\overline{54}5\ m$

Total

$185.2616495 + 191.72713 + 178.23096 - 209.4545m = 345.76519405\ m$