- ve ↓ $x_i = 4000\,m$, $v_i = -20\,m/s$, $t_i = 0\,s$, $v_f = ?$, $t_f = ?$, $a = 9.80\,m/s^2$

$x_f = 0\,m$

What will the velocity be at 1500m from the ground

$x_i = 4000\,m$ $t_i = 0\,s$ $v_i = -20\,m/s$

$x_f = 1500\,m$ $t_f = ?$ $v_f = ?$ $a = 9.8\,m/s^2$

$$v_f^2 = v_i^2 + 2a\Delta x$$

$$v_f = \pm\left[v_i^2 + 2a\Delta x\right]^{1/2}$$

$$= -\left[(-20\,m/s)^2 + 2(-9.8\,m/s^2)(1500\,m - 4000\,m)\right]^{1/2}$$

$$\boxed{v_f = -222\,m/s}$$

$t_f = ?$ $\quad v_f = v_i + a\Delta t$

$$\Delta t = \frac{v_f - v_i}{a} = \frac{-222.261\,m/s - (-20\,m/s)}{-9.8\,m/s^2}$$

$t_i = 0 \Rightarrow \boxed{t_f = 20.6\,s}$

Finding t_f using Eq'n. 3

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

$$\frac{1}{2}a\Delta t^2 + v_i\Delta t + (x_i - x_f) = 0$$

Quadratic Eq'n. $\underbrace{\frac{1}{2}(-9.8\,m/s^2)}_{a}\Delta t^2 \underbrace{-(20\,m/s)}_{b}\Delta t \underbrace{+2500\,m}_{c} = 0$

Quadratic Formula $\quad \Delta t = \dfrac{-b \pm \left[b^2 - 4ac\right]^{1/2}}{2a}$

$$\Delta t = \frac{20\,m/s \pm \left[(-20\,m/s)^2 - 4(-4.9\,m/s^2)(2500\,m)\right]^{1/2}}{2(-4.9\,m/s^2)}$$

$$\Delta t = -2.041\,s \pm 22.68\,s$$

Pick the positive root: $\boxed{t_f = 20.6\,s}$ ($t_i = 0$)