Question 3:

In a rocket sled deceleration experiment, a manned sled is decelerated from a speed of 200 mph (89.4 m/s) to a stop at a constant rate of 18Gs (176.6 m/s^2). How long does it take for the sled to stop? How far does the sled travel while decelerating?

$t = ?$

$V(o) = 89.4 \, m/s$

$V(t') = 0$

$a = -176.6 \, m/s^2$

$a(t) = -176.6$

$V(t) = -176.6 t + C \quad \swarrow V_o = 89.4$

$V(t) = -176.6 t + 89.4$

time to stop

$V(t') = 0 = -176.6 t' + 89.4 \quad \rightarrow \quad \boxed{t' = .506 \, s}$

$$X(t) = \frac{-176.6}{2} t^2 + 89.4 t + \overset{\circ}{\cancel{X_0}} \qquad X_0 = 0$$

$$\uparrow \qquad \uparrow$$

$$t' = .506 s$$

$$X(t') = \frac{-176.6}{2} (.506)^2 + 89.4 (.506) = \boxed{22.63 m}$$

distance traveled