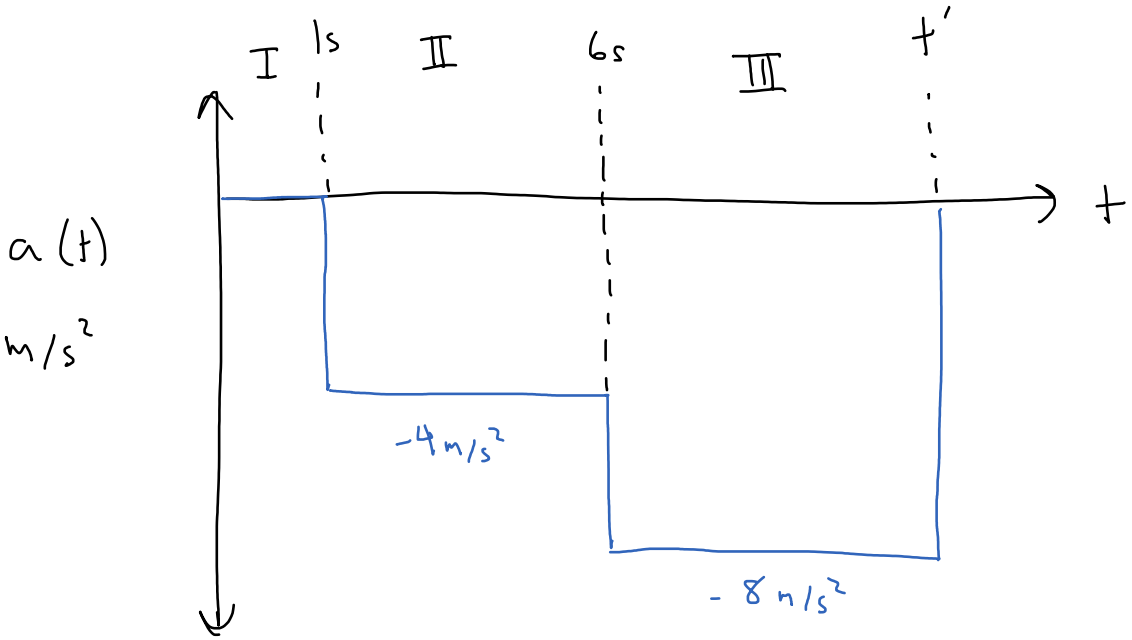
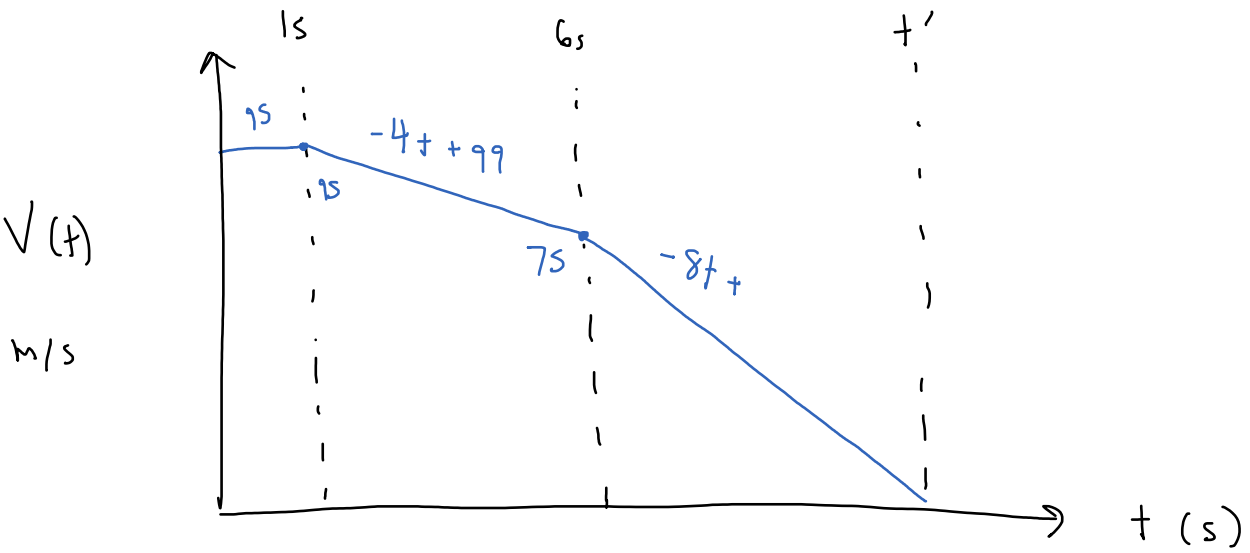
Question 2:

A plane with an initial speed of 95 m/s touches down on a runway. For the first second the plane rolls without decelerating. For the next 5 seconds reverse thrust is applied, decelerating the plane at a rate of 4 m/s^2. Finally, the brakes are applied with reverse thrust increasing the rate of deceleration to 8 m/s^2. How long does it take for the plane to come to a complete stop? How far does the plane travel before coming to a complete stop?





I $V(t) = \int a(t) = \int 0$

$V(t) = 0 + C$ ← $V_0 = 95$ m/s

$V(t) = 95$

$V(1) = 95$ ↓

II $V(t) = \int a(t) = \int -4$

$V(t) = -4t + C$ ← $t = 1$, $V = 95$

$C = 99$

$V(t) = -4t + 99$

$V(6) = 75$ ↓

III $V(t) = \int a(t) = \int -8$

$V(t) = -8t + C$ ← when $t = 6$, $V = 75$

$C = 123$

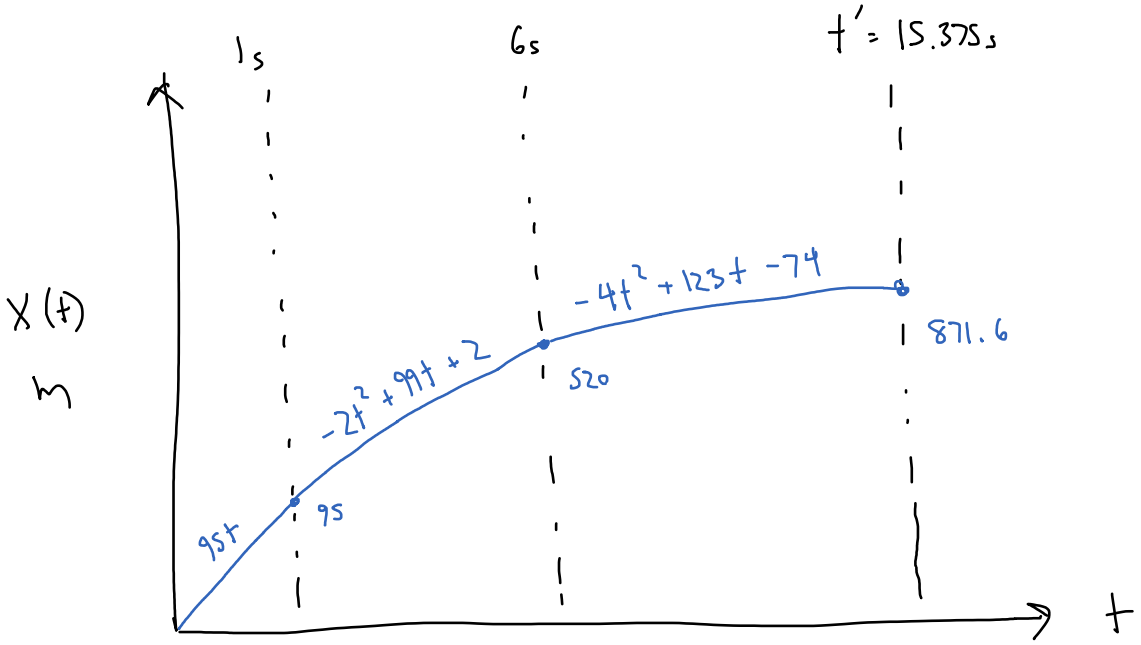
$V(t) = -8t + 123$

at t' $V = 0$

$0 = -8t' + 123$

$t' = 15.375$ s

time to stop



I $x(t) = \int v(t) = \int 95$

$x(t) = 95t + C$ ← $x_0 = 0$

$x(1) = 95_m$

II $x(t) = \int v(t) = \int -4t + 99$

$x(t) = -2t^2 + 99t + C$ ← when $t = 1$, $x = 95$

$C = -2$

$x(t) = -2t^2 + 99t - 2$

$x(6) = 520\,m$

III $x(t) = \int v(t) = \int -8t + 123$

$x(t) = -4t^2 + 123t + C$ ← when $t = 6$, $x = 520$

$C = -74$

$x(t) = -4t^2 + 123t - 74$

$x(15.375) = 871.6\,m$

distance to stop