Chase Problems

A police car is stopped at a red light. As the light turns green, a diesel truck hurtles past in the next lane traveling at a constant speed of 28 m/sec. If the police car, siren blaring and lights flashing, accelerates at 4 m/sec², how many seconds will it take to catch the truck? How far does the chase extend? How fast is the cop going?

truck	cop
28 m/s	$v_i = 0$
$a = 0$	$a = 4 m/s$

$t_t = t_c$

$d_t = d_c$

$d_t = 28t + \frac{1}{2}0t^2$

$d_c = 0t + \frac{1}{2}(4)t^2$

$28t = 2t^2$

$14_s = t$

$d = 392m$

$V_t = 0 + 4(14)$

$V_c = 56 m/s$

A police car notices a speeder on the highway at 40m/s. When the speeder is 50m down the road, the police officer accelerates from rest at 1.2m/s2. How long until it catches the speeder? How far does the cop travel? How fast is the police officer going?

S	C
$V_i = 40 m/s$	$V_i = 0$
$a = 0$	$a = 1.2 m/s^2$

$t_s = t_c$

$d_c = d_s + 50$

$d_c = 0t + \frac{1}{2}(1.2)t^2 = d_s + 50$

$d_s = 40t$

$0.6t^2 = 40t + 50$

$0.6t^2 - 40t - 50 = 0$

$t = 67.89s$

$V_t = 81.47 m/s$

$d_c = 2765.43m$ $d_s = 2715.43m$

A cheetah stalks a giraffe at 1.2m/s. The giraffe strolls at an initial speed of 0.92m/s. When the cheetah is 100m away, the giraffe smells her and starts to accelerate at 1.1m/s2. The cheetah accelerates at 3.7m/s2. How long until the cheetah catches the giraffe? How far does the chase extend? How fast is the cheetah going? How fast is the giraffe going?

C	G
$V_i = 1.2 m/s$	$V_i = 0.92 m/s$
$a = 3.7 m/s^2$	$a = 1.1 m/s^2$

$t_c = t_g$

$d_c = d_g + 100$

$d_c = 1.2t + \frac{1}{2}(3.7)t^2 = d_g + 100$

$d_g = 0.92t + \frac{1}{2}(1.1)t^2$

$1.2t + \frac{1}{2}(3.7)t^2 = 0.92t + \frac{1}{2}(1.1)t^2 + 100$

$t = 8.66s$

$d_c = 149.13m$ $d_g = 49.13m$

$V_c = 33.242 m/s$ $V_g = 10.446 m/s$