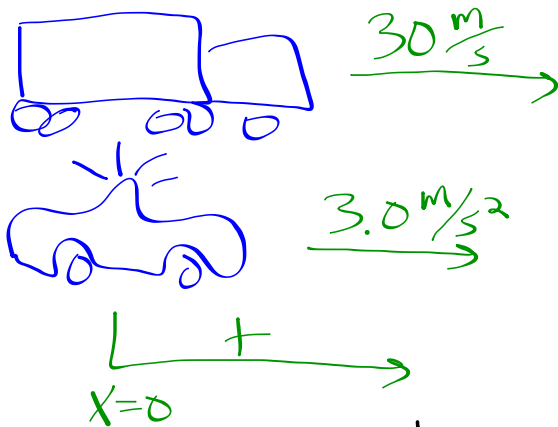A truck traveling at a constant speed of 30 m/s passes a highway patrol police car which is at rest. As soon as the truck is even with the police car, the police officer accelerates at a constant rate of 3.0 m/s². How long does it take for the police car to catch up to the truck?

$$30 \frac{m}{s}$$

$$3.0 \frac{m}{s^2}$$

$$\underset{X=0}{\llcorner \quad t \longrightarrow}$$

Car

$X_0 = 0$

$X = \frac{3}{2}t^2$ $\overset{\text{same } t}{\underset{\text{end}}{\Longleftrightarrow}}$

$V_0 = 0$

$V =$

$a = 3^m/_{s^2}$

$t =$ $\overset{\text{same}}{\Longleftrightarrow}$

truck

$X_0 = 0$

$X = 30t$

$V_0 = 30 \frac{m}{s}$

$V = 30 \frac{m}{s}$

$a = 0$

$t =$

Car

$$X = X_0 + V_0 t + \frac{1}{2}at^2$$

$$X = \frac{1}{2}(3)t^2$$

$$= \frac{3}{2}t^2$$

truck

$$X = X_0 + V_0 t + \frac{1}{2}at^2$$
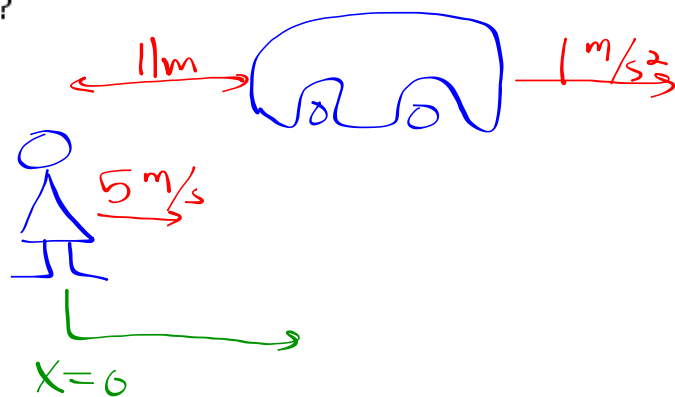
$$X = 30t$$

$$\frac{3}{2}t^2 = 30t$$

$$\frac{3}{2}t^2 - 30t = 0$$

$$t\left(\frac{3}{2}t - 30\right) = 0$$

$$t = 0 \qquad \frac{3}{2}t - 30 =$$

$$\boxed{t = 20s}$$

A bus is stopped picking up passengers. When everyone is on board, the bus starts to leave. A woman who is 11.0 meters behinds the bus realizes she is going to miss the bus if she doesn't start running. If she starts running and is moving at a constant 5.00 m/sec as the bus starts to leave, and if the bus leaves with a constant acceleration of 1.00 m/sec², *how far does she need to run* to reach the bus?

$X = 16.34_m$

11m

$1 \, ^m/s^2$

$5 \, ^m/s$

$X = 0$

woman

$X_0 - 0$
$X - 5t$
$v_0 - 5 \, ^m/s$
$v - 5 \, ^m/s$
$a - 0$
$t - \frac{x}{5}$ 3.27 s

SAME @ end

bus

$X_0 - 11 \, m$
$X_0 - 11 + 0.5t^2$
$v_0 - 0$
$v -$
$a - 1 \, ^m/s^2$
$t - \sqrt{2(x-11)}$

Woman

$X = X_0 + v_0 t + \frac{1}{2}at^2$
$X = 5t$

bus

$X = X_0 + v_0 t + \frac{1}{2}at^2$
$X = 11 + 0.5t^2$

$5t = 11 + 0.5t^2$

$0.5t^2 + -5t + 11 = 0$

$t = 6.73s$ or $\boxed{t = 3.27s}$

$X = 5t$
$= 5(3.27) = \boxed{16.34m}$

5

v

$a=0$

$a=+$

O t

$slope = a$

v

O t

$a = 1 \, m/s^2$
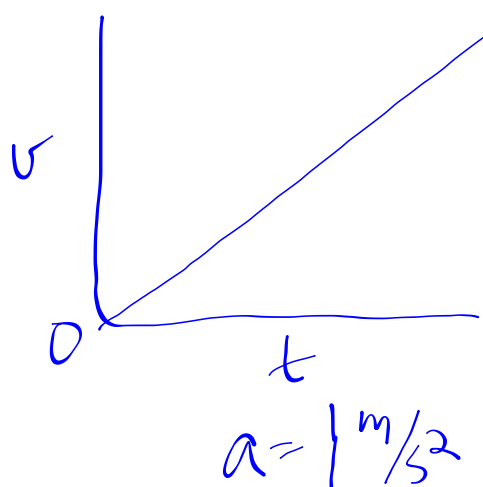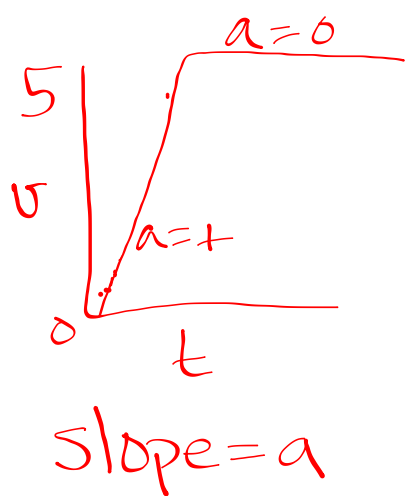
1.99 m = height of rocket at launch

<u>Before</u> you leave class,
know how to find the maximum height.

1. Figure it out
* 2. Figure it out with a few
　　small hints/pushes
3. Follow along with someone else
4. Ask someone & write it down