9-11-13 1

List of possible Test 1 Problems

Test 1 is 9-20

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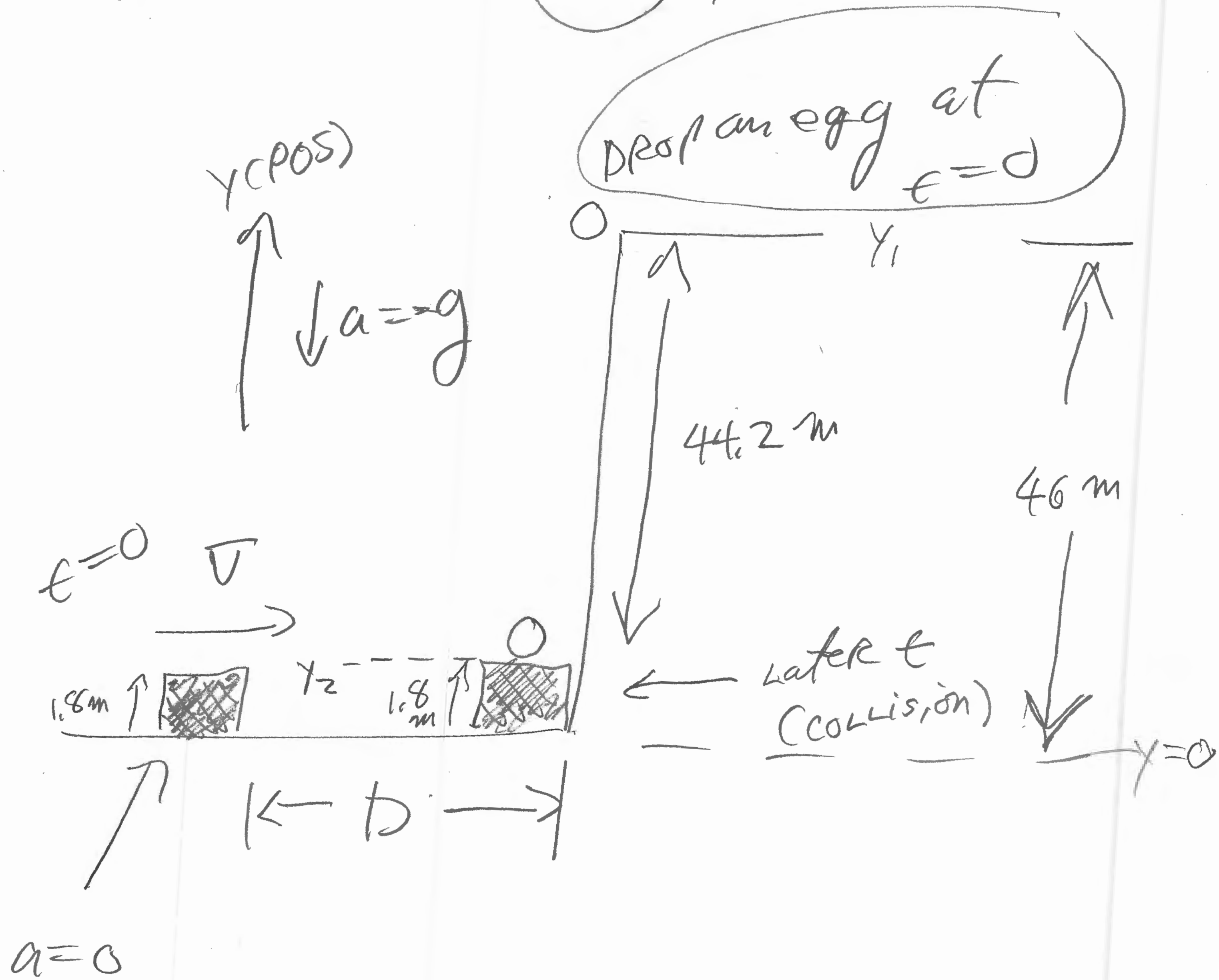
HINT TO # 73, CH 2



$$D = v \cdot t$$

egg ALSO: $\Delta y = v_1 \Delta t - \frac{1}{2} g \Delta t^2$; $v_1 = 0$ DROP

$$\Delta y = y_2 - y_1 = -\frac{1}{2} g \Delta t^2$$

HINT on WAphysics: $\downarrow$ y(pos) $\downarrow a = +g$

#23.

$$y_2 - y_1 = -44.2 = -\frac{1}{2} g \Delta t^2$$

$$\Delta t = \sqrt{\frac{2 \cdot 44}{g}}$$

$$\cong \sqrt{\frac{88}{10}} \approx 3 (s)$$

$$\underline{D = V \cdot \Delta t} = \left(1.20 \frac{m}{s}\right)\left(2.99 (s)\right) = 3.6 (m)$$

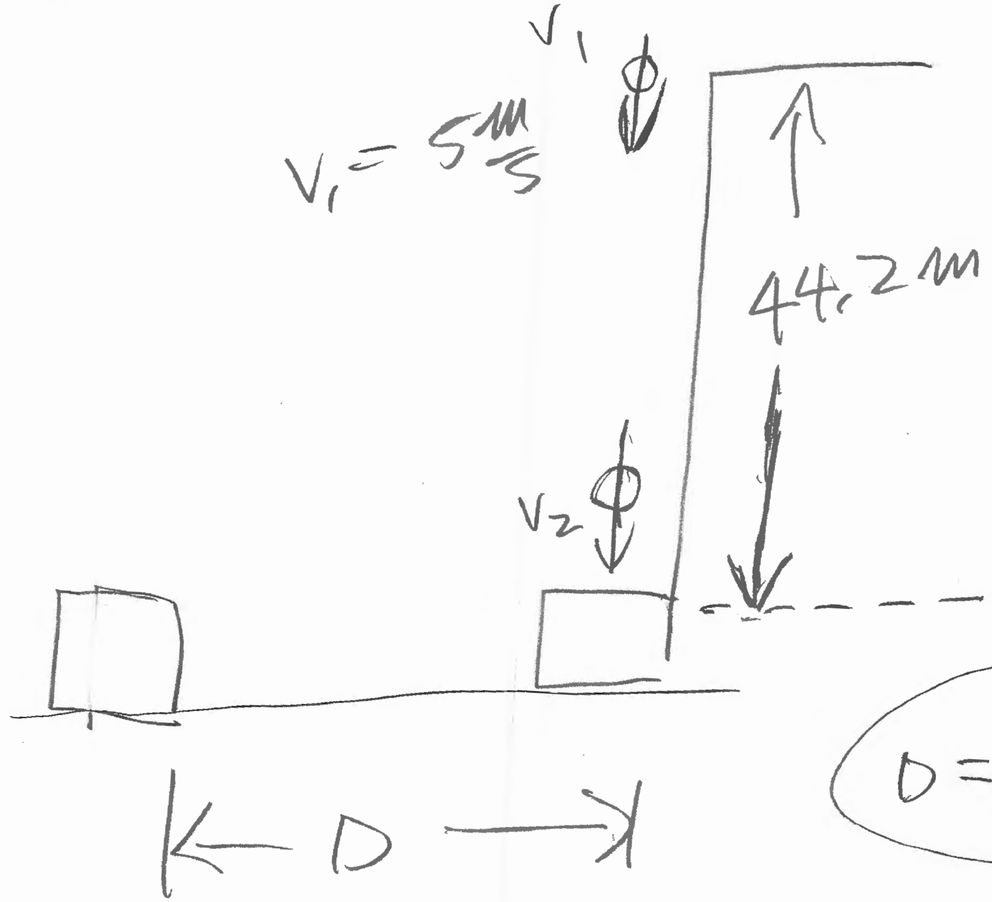
$$\approx 12 \text{ ft}$$

WHat IF? (1.) suppose Egg is THROWN DOWN with speed $5 \frac{m}{s}$

(2.) suppose PRofessor accellerates rightward with $a = 2 \frac{m}{s^2}$.

(4)

#73 what if: $\downarrow$ y (pos) $\downarrow a = +g$



$$D = \bar{V}\Delta t + \frac{1}{2}a\Delta t^2$$

Need Δt: Brute force:

$$\Delta y = 44.2 = v_1 \Delta t + \frac{1}{2} g \Delta t^2$$

$$44.2 = 5 \cdot \Delta t + \frac{1}{2} 9.8 \Delta t^2$$

$$4.9\Delta t^2 + 5\Delta t - 44.2 = 0 \quad \text{solve}$$

ALT. method for Δt $\Delta y = \bar{V} \cdot \Delta t$

without quadratic equation: $44.2 = \bar{V} \cdot \Delta t$, $\bar{V} = \frac{v_1 + v_2}{2}$,

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Get v_2:

$$v_2^2 = v_1^2 + 2g\Delta y$$

$$v_2^2 = (5)^2 + 2(9.8)(44.2)$$

note: $\Delta y > 0$ since $\downarrow$ y (pos)

$$\Delta y = y_2 - y_1$$

$$= 44.2 - 0$$

$$v_2 = +\sqrt{25 + 2(9.8)(44.2)}$$

$$v_2 = 29.9 \frac{m}{s}$$

$$\Delta y = \bar{v} \cdot \Delta t \quad , \quad \frac{v_1 + v_2}{2} = \bar{v}$$

(a = constant)

$$\Delta t = \frac{44.2}{\left(\frac{5 + 29.9}{2}\right)} = \frac{44.2}{17.5} = 2.53 \text{ (s)}$$

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CH2 : $\Delta x = v_1 \Delta t + \frac{1}{2} a \Delta t^2$; $D = \Delta x$

#73

what if?

$D = V_0 \Delta t + \frac{1}{2} a \Delta t^2$

$D = (1.2 \frac{m}{s})(2.53s) + \frac{1}{2}(2 \frac{m}{s^2})(2.53s)^2$

$D = 3.03 + (2.53)^2$

$\boxed{D = 9.44 (m)}$

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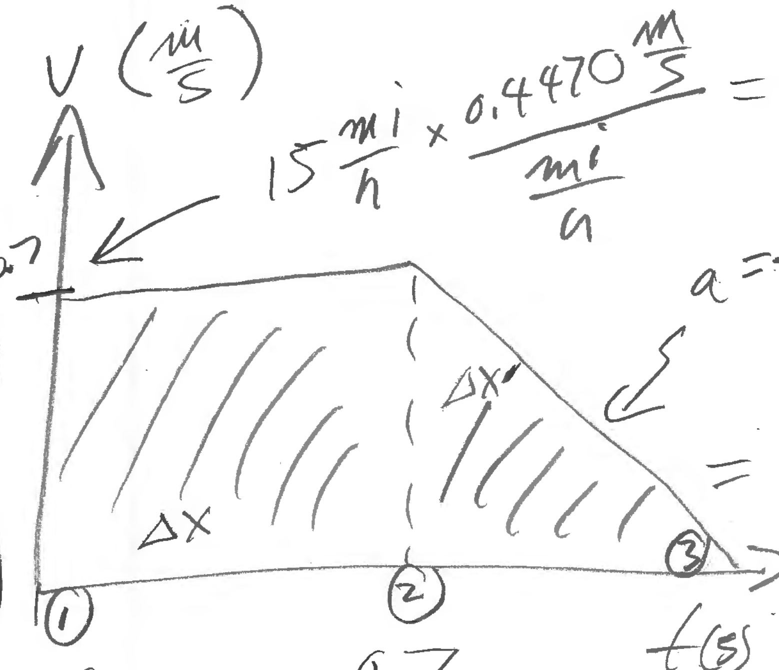
#38

$1\,\frac{ft}{s} = 0.3048\,\frac{m}{s}$

$1\,\frac{mi}{h} = 0.4470\,\frac{m}{s}$

$15\,\frac{mi}{h} \times \frac{0.4470\,\frac{m}{s}}{\frac{mi}{h}} = 6.7\,\frac{m}{s}$



$a = -12\,\frac{ft}{s^2} \times \frac{0.3048\,\frac{m}{s^2}}{ft/s^2} = -3.66\,\frac{m}{s^2}$

t=0 — driver sees a barrier to avoid

0.7 — driver puts on brakes

$1\,\frac{ft}{s^2} = 0.3048\,\frac{m}{s^2}$

Get TOTAL DISTANCE:

$\Delta x = x_2 - x_1$

$$\Delta x = v_1 \Delta t + \frac{1}{2} a \Delta t^2 ;\ a = 0$$

$$\Delta x = (6.7\,\tfrac{m}{s})(0.7s) = 4.69\ m$$

$$\Delta x' = v_2 \Delta t' + \frac{1}{2} a \Delta t'^2 ;\ \Delta x = x_3 - x_2$$

NOTE: $a = \dfrac{v_3 - v_2}{\Delta t'}$; $v_3 = 0$, $v_2 = 6.7\,\frac{m}{s}$

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$$\Delta x' = 6.7 \cdot \Delta t' + \frac{1}{2}(-3.66)\Delta t'^2$$

$$\Delta t' = \frac{v_3 - v_2}{a}$$

$$\Delta t' = \frac{0 - 6.7}{-3.66} = 1.83(s)$$

$$\Delta x' = \underbrace{6.7(1.83)} - \frac{1}{2}(3.66)(1.83)^2$$

$$= 12.261 - 6.128$$

$$= 6.13$$

$$\Delta x_{total} = 4.69 + 6.13$$

$$= \boxed{10.82(m)}$$

$\approx$ 30 ft

NOTE: ALT. FOR $\Delta x'$: $v_3^2 = 0 = v_2^2 - 2\left(3.66\frac{m}{s^2}\right) \cdot \Delta x'$

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ACT for $\Delta x'$:

$$0 = v_2^2 - 2\left(3.66\,\frac{m}{s^2}\right)\cdot\Delta x'$$

$$\Delta x' = \frac{v_2^2}{(2)(3.66)\frac{m}{s^2}} = \frac{6.7^2}{(2)(3.66)} = 6.13\,(m)$$