KEY

Acceleration Problems

- An object has a velocity (in SI units) given by the expression $v = 3t^2 10t + 5$. If it starts at the origin, after 5 seconds:
 - a. What is its acceleration?

b. Where is it?

Since
$$V = \frac{dx}{dt}$$

 $X = t^3 - 5t^2 + 5t$

$$\int_{0}^{\infty} so x(s) = (s)^{3} - 5(s)^{2} + 5(s)$$

2. A Boeing 767 airplane can accelerate at a rate of 3.3 m/s². If a 767 starts from rest,

$$\alpha = \frac{V_f - V_t}{t}$$

$$\alpha = \frac{\sqrt{f - V_c}}{t}$$
 3.3 = $\frac{100 - 0}{t}$

u: = 0 m/s

V_E = 100 m(s
b. How far would it travel in that time?

$$X = \frac{1}{2}at^2 + vit + \pi i$$

 $X = \frac{1}{2}(3.3)(30.3)^2 = 1515 m$

c. What would be the average speed of the plane over this interval?

$$\overline{V} = \frac{\Delta x}{t} = \frac{(515)}{30.3} = \frac{50}{50} \text{ m/s} \quad \text{or } V = \frac{V_0 + V_0}{2} = \frac{0 + 60}{2}$$
 $V_0 = \frac{\Delta x}{t} = \frac{(515)}{30.3} = \frac{50}{50} \text{ m/s} \quad \text{or } V = \frac{V_0 + V_0}{2} = \frac{0 + 60}{2}$

- 3. Carly constantly accelerates from rest, covering a distance of 20 meters in a time of 3.0 seconds.
 - a. What was Carly's acceleration?

$$V_{c} = 0 \text{ m/s}$$

 $\Delta x = 20 \text{ m}$
 $E = 35$

$$\Delta x = \frac{1}{2}at^{2} + V_{c}t$$
 $20 = \frac{1}{2}a(3)^{2}$

b. What was her final velocity?

4. Sam is riding her bike with a speed of 5 m/s. She then constantly accelerates at a rate of 2

a. How long will it take her to reach a speed of 10 m/s?

$$a = 2 \frac{m}{5^2}$$
 $a = \frac{\sqrt{f - v}}{t}$ $z = \frac{10 - 5}{t}$

b. How far will she travel in that time?

$$\Delta x = \frac{1}{2}at^{2} + v_{i}t$$
= $\frac{1}{2}(2)(25)^{2} + (5)(25)$

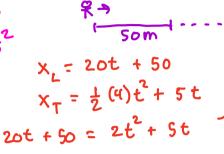
or
$$V = V_{i+1}V_{f} = \frac{5+10}{2} = 7.5$$

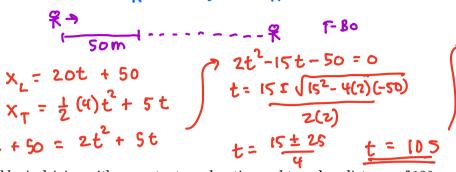
$$\overline{V} = \underbrace{\Delta X}_{\xi} \qquad \text{side 1}$$

$$4.5 = \underbrace{\Delta X}_{2.5}$$

Acceleration Problems

5. Lewbert is traveling with a constant speed of 20 m/s when he passes T-Bo, who has a speed of 5 m/s. When Lewbert is 50 meters ahead of T-Bo, T-Bo tries to catch up to Lewbert with a constant acceleration of 4 m/s². How fast is T-Bo going when he passes Lewbert? &→ 20 m/s ---- &





- = 4(6)+5
- 6. Gibby is driving with a constant acceleration and travels a distance of 120 meters in 4 seconds. He has a final speed of 40 m/s. What was his acceleration?

$$\Delta x = 120 \text{ m}$$

 $t = 45$
 $V_f = 40 \text{ m/s}$

45
$$\sqrt{\frac{1}{2}} = \frac{\sqrt{1 + \sqrt{1 + \sqrt{1$$

$$a = \sqrt{f - v}$$
: $= \frac{40 - 20}{4}$

Spencer has a constant acceleration of 3 m/s² for a distance of meters. His final velocity is 20 m/s. How long did it take him to travel that distance?

$$V_f^2 = V_i^2 + 2a \times \bar{V} = (20)^2 = V_i^2 + 2(3)(50)$$

$$V_i^2 = 100$$

$$V_i = 10 \text{ M/s } \left(\text{or } V_i = -10 \text{ M/s}\right)$$

$$\overline{V} : \frac{\sqrt{2}}{2} = \frac{\sqrt{2}}{2} = \frac{15}{2}$$

$$\overline{V} : \frac{\Delta X}{t} \rightarrow 15 = \frac{50}{t}$$

$$-10 \text{ M/s}$$

$$\boxed{t = 3.33 \text{ s}}$$

- Goes backwards first, then Comands
- Starting from rest, Freddie has a constant acceleration for 7 seconds. He then slows to a stop with a different constant acceleration in 12 seconds. He traveled a total of 90 meters. What was his maximum speed?

