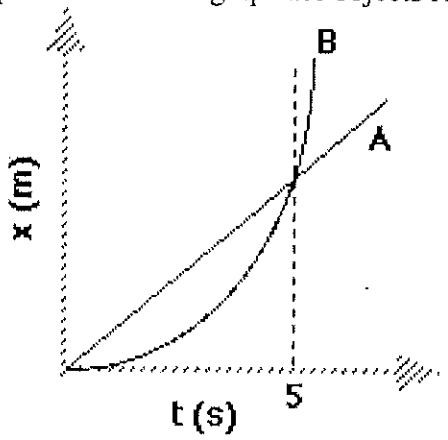
Name_____

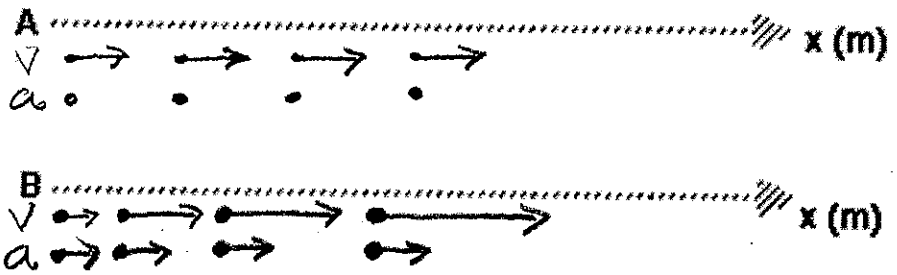
Date_____Pd____

UNIT III: REVIEW

1. Consider the position vs time graph for objects A and B below.



a. Draw qualitative motions maps for objects A and B. Be sure to include acceleration vectors.



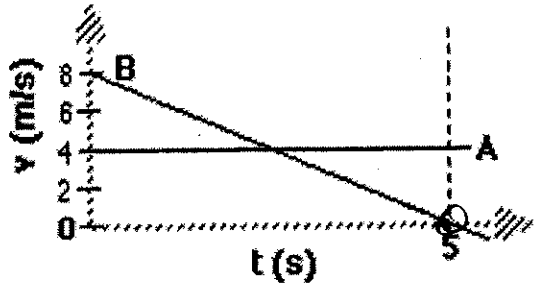
b. How does the motion of object A differ from that of object B?

'A' MOVES AT A CONSTANT VELOCITY WHILE 'B' MOVES WITH INCREASING VELOCITY.

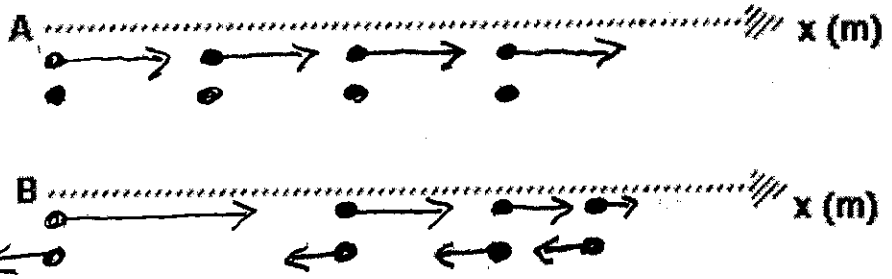
c. In the chart below, you will compare **qualitatively** objects A and B (use statements like A > B, A < B, or A = B, etc.), then provide a brief explanation for your answer.

	Comparison	**How do you know?**
Displacement at **t** = 5s:	A = B	THEY ARE AT THE SAME POINT ON A POSITION GRAPH
Ave. velocity from **t** = 0 s to **t** = 5s:	A = B	SAME DISPLACEMENT OVER SAME TIME $\left(\frac{\Delta x}{\Delta t}\right)$
Instantaneous velocity at **t** = 5s:	A < B	SLOPE OF A IS LESS THAN SLOPE OF 'B' (AT A GIVEN POINT SLOPE IS INST. VELOCITY)

2. Consider the **velocity** vs time graph for objects A and B below.



a. Draw qualitative motion maps for objects A and B. Be sure to include acceleration vectors.



b. In the chart below, you will compare **qualitatively** objects A and B (use statements like A > B, A < B, or A = B, etc.), then provide a brief explanation for your answer.

	Comparison	**How do you know?**
Ave. velocity from **t** = 0s to **t** = 5s:	A = B	$\frac{8-5}{2} = \frac{20m}{5s}$ $\quad \frac{4-5}{5} = \frac{20m}{5s}$ 4 m/s $\quad$ 4 m/s A = 4m/s $\quad$ B = 0m/s
Instantaneous velocity at **t** = 5s:	A > B	
Acceleration at **t** = 5s:	A > B	A = 0m/s² $\quad$ B $\frac{-8m/s}{5s} = -1.6 m/s^2$

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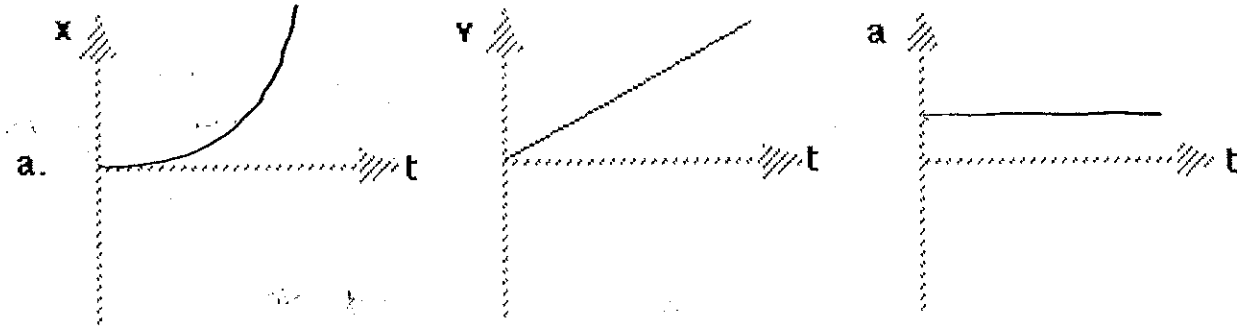
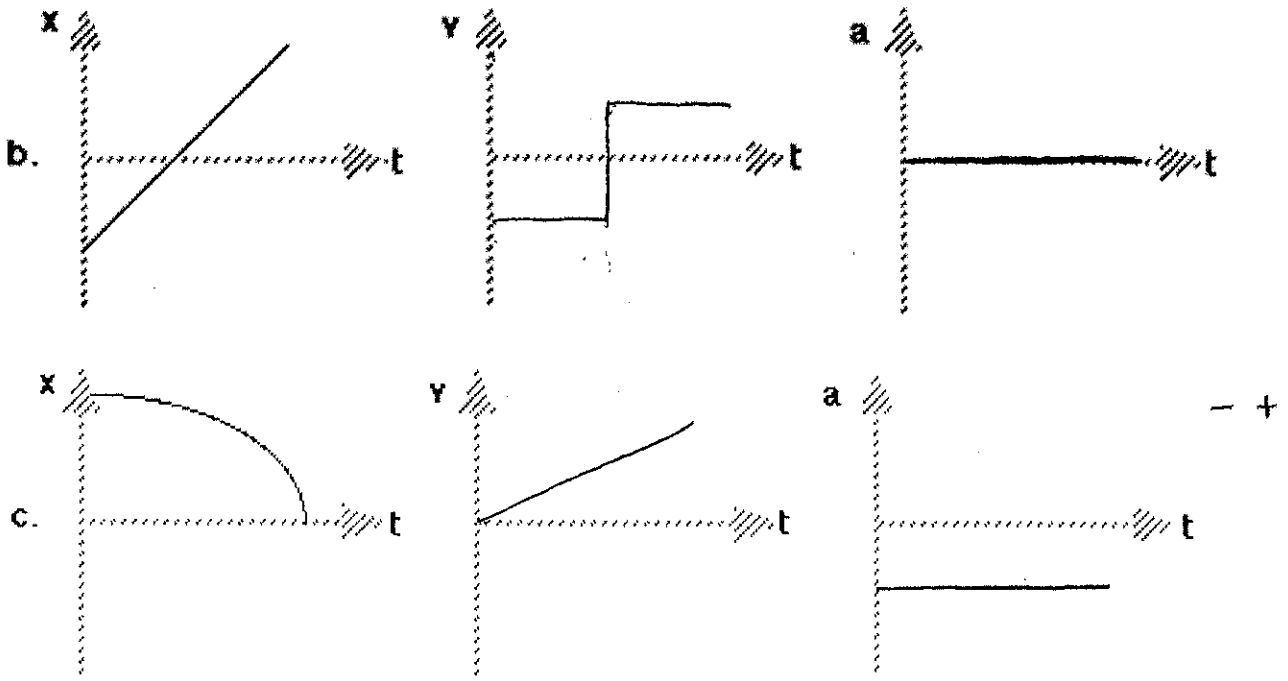
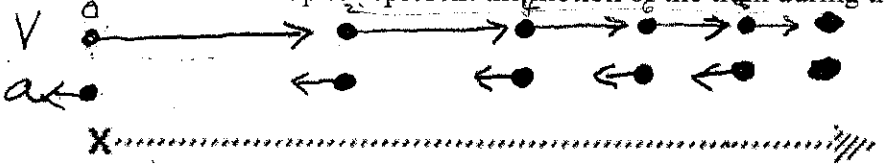
3. From the given graph in each of the sets below, sketch the shape of the corresponding graphs.



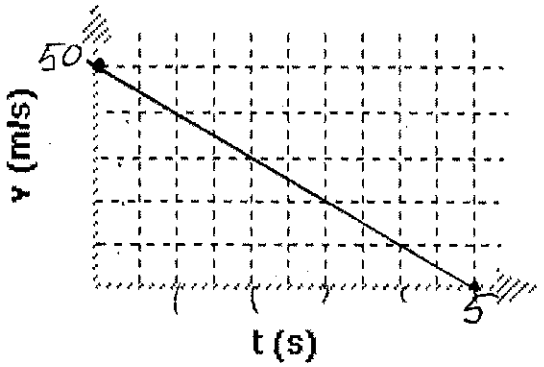


4. A train with a velocity of 50. m/s must come to an emergency stop in 10.s. It slows at a constant rate.

a. Draw a motion map to represent the motion of the train during the 10 s.



b. Sketch a **quantitative** velocity vs time graph to represent the motion of the train.



c. What is the acceleration of the train? Show work; use labels.

$a = \frac{\Delta V}{\Delta t} = \frac{0 - 50\ m/s}{5\ s} = -10\ m/s^2$

d. How far will the train travel in these 10. seconds? $\Delta x = \frac{1}{2}\Delta V t$

$= \frac{50 \cdot 5}{2} =$ **125 m**

M: 8
ST: 8

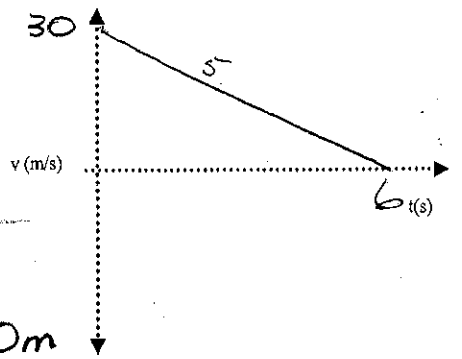
e. How fast will the train be going 3.0 seconds after it puts on the brakes?

$a\left(\frac{V_f - V_i}{\Delta t}\right) = \left(V_i + a\Delta t\right) = 50\ m/s + (-10\ m/s^2 \cdot 3\ s)$

$50\ m/s - 30\ m/s =$ **20 m/s**

Use formulas or graphing methods to solve. Show your work and graphs. Circle your answers.

5. A car moving at 30 m/s (t=0) has a blow out and slows at a rate of 5 m/s/s until stopped.
   a) How much time does it take the car to stop?
   b) How far does it travel after the blowout?



A: $a = \frac{\Delta V}{\Delta t}$ $\Delta t = \frac{\Delta V}{a} = \frac{-30\ m/s}{-5\ m/s^2} = \boxed{6\ s}$

KINEMATIC

B: $\Delta x = \frac{1}{2} a t^2 = \frac{-5\ m/s^2 \cdot 36\ s^2}{2} = 90\ m$

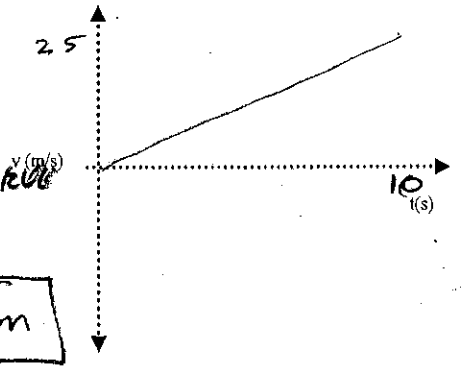
UNDER CURVE

$\Delta x = \frac{1}{2} V_i t$

$\frac{30 \cdot 6}{2} = 90\ m$

5

6. A tractor can uniformly accelerate from rest to a speed of 25 m/s in 10 s.
   a) What is the average acceleration of the tractor?
   b) What distance does the tractor travel in this time?



A: $a = \frac{\Delta V}{\Delta t} = \frac{25\ m/s}{10\ s} = \boxed{2.5\ m/s^2}$

B - AREA UNDER CURVE

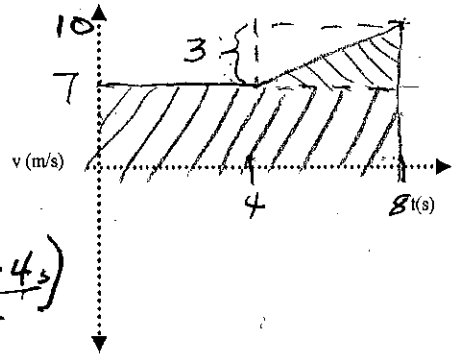
KINEMATIC

B: $\Delta x = \frac{1}{2} a t^2 = \frac{2.5\ m/s^2 \cdot 100\ s^2}{2} = \boxed{125\ m}$

$\Delta x = \frac{\Delta V \cdot t}{2}$

$\frac{25 \cdot 10}{2} = \boxed{125\ m}$

7. A dog chases a beaver across the yard with an initial speed of 7 m/s for 4 s, then uniformly increases its speed to 10 m/s in 4 s and catches the beaver, whereupon the beaver commences to kick the stuffing out of the dog.
   a) What was the dog's acceleration during the 2nd part of the motion?
   b) How far did the dog travel before it caught the beaver?



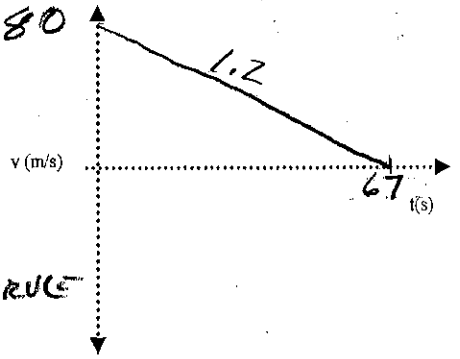
A: $a = \frac{\Delta V}{\Delta t} = \frac{10 - 7\ m/s}{4\ s} = \frac{3\ m/s}{4\ s} = \boxed{.75\ m/s}$

B: $(7\ m/s \cdot 8\ s) + \left(\frac{3\ m/s \cdot 4\ s}{2}\right)$

$56 + 6$

$\boxed{62\ m}$

8. An engineer is designing the runway for an airport. Of the planes that will use the airport, the slowest acceleration rate on landing is likely to be 1.2 m/s^2 (brake failure upon landing). The landing (touchdown) speed for this plane is 80 m/s. Assuming this minimum acceleration, what is the minimum allowed length of runway to land if the brakes on the aircraft fail?



PLAN: FIND time to stop

$\left(a = \frac{\Delta V}{\Delta t}\right)$, $\Delta t = \frac{\Delta V}{a}$

$\frac{-80\ m/s}{-1.2\ m/s^2}$

67 s

2) FIND AREA UNDER CURVE

$\Delta x = \frac{1}{2} V t$ $80 \cdot 67$

$\boxed{2680\ FT}$

or

$\boxed{2700\ FT}$