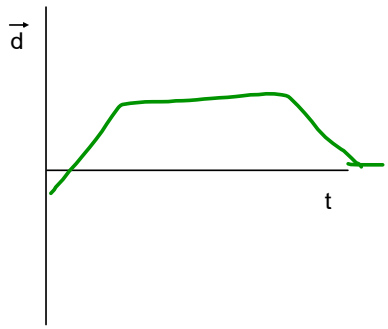
Homework - Questions???

Displacement-Time Graphs

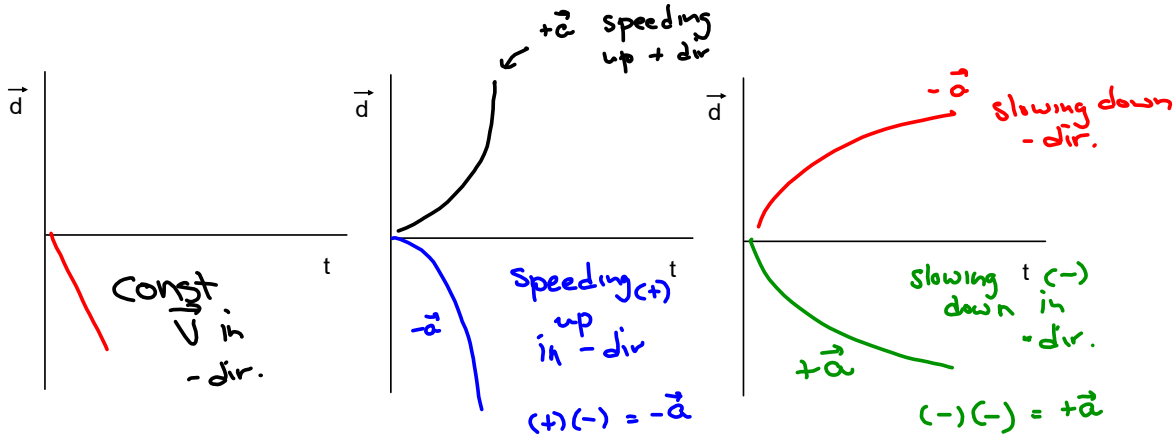


velocity indicates direction of motion

Slope =

+ slope means _____

- slope means _____



Direction of $\vec{a}$ is the same as the direction of the force required to cause it

Curved line means _____

Average Velocity vs. Average Speed

Assume Saint John is 100 km south of Fredericton. We drive to Saint John in 1 hour.

Average speed

$$v_{ave} = \frac{d}{t}$$
$$= \frac{100\,km}{1\,h}$$
$$= 100\,\frac{km}{h}$$

Average velocity

$$\vec{v}_{ave} = \frac{\vec{d}}{t}$$
$$= \frac{100\,km\ S}{1\,h}$$
$$= 100\,\frac{km}{h}\ S$$

Now assume we return to Fredericton in 1 hour (so we have now travelled 200 km in 2 hours)

Average speed

$$v_{ave} = \frac{d}{t}$$
$$= \frac{200\,km}{2\,h}$$
$$= 100\,\frac{km}{h}$$

Average velocity

$$\vec{v}_{ave} = \frac{\vec{d}}{t}$$
$$= \frac{\text{☺}\ km}{2\,h}$$
$$= \text{☺}\,\frac{km}{h}$$

Average Velocity vs. Instantaneous Velocity

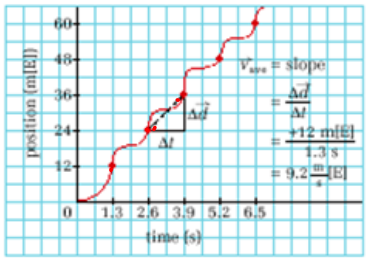
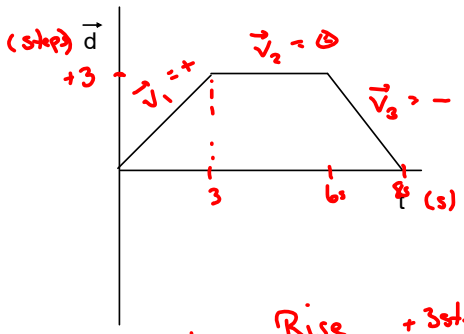


Figure 2.13 The sharp curves in the graph indicate that the skate boarder's velocity was constantly changing. You would expect this jerky motion from a novice skateboarder.



$\vec{v}_1$ = slope = $\frac{\text{Rise}}{\text{Run}} = \frac{+3\text{steps}}{3\text{s}} = +1$ step/s

$\vec{v}_2$ = slope = 0 steps/s

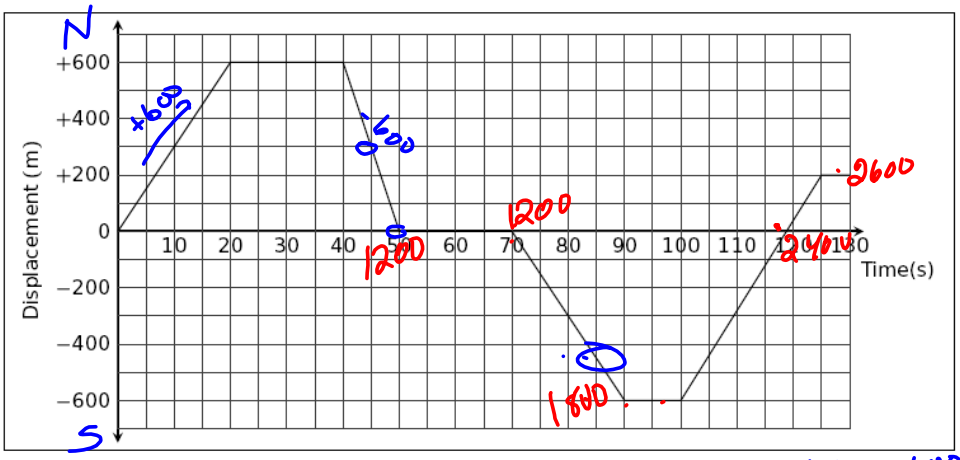
$\vec{v}_3 = \frac{\text{Rise}}{\text{Run}} = \frac{-3\text{steps}}{2\text{s}} = -1.5$ steps/s

$\vec{v}_{ave} = \frac{\vec{d}}{t} = 0$ steps/s $\neq \frac{\vec{v}_1 + \vec{v}_2 + \vec{v}_3}{3}$

NEVER.

Displacement - Time Graph # 1

Motion Graph #1 - The following graph indicates the motion of a car along a North-South path.



1. What was the total distance travelled to 50 s? — 600 + 600m = 1200 m
2. What was the displacement of the car at 50 s? — ☺ m
3. When, if at all, was the car stopped? — slope = ☺ — 20-40, 50-70, 90-100, 125-130s
4. When did the car return to the starting point? — $\vec{d} = ☺$ — 50, 119s (or 118s)
5. What was the car's displacement at 85 s? — y-axis — -450 m (ish)
6. What was the average velocity in the first 45 s? — $\vec{v}_{ave} = \vec{d}/t$ — $\frac{+300m}{45s} = +6.7 m/s$
7. What is the average velocity up until 25.0 s? — $\vec{v}_{ave} = \vec{d}/t$ — $\frac{+600m}{25s} = +24 m/s$
8. When was the velocity constant? — everywhere except 20, 40, 50, 70, 90, 100, 125s
9. When did the car first start to move southward? — 1st $-\vec{v}$ — 40s
10. What total distance did the car travel? — 2600m

$|-3| = 3$

$|+3| = 3$

↑ absolute value (size or length)

11. What was the car's total displacement? 11. $+200\,m$

12. What was the car's velocity at 85 s? 12. $\text{slope} = \frac{\text{Rise}}{\text{Run}} = \frac{-600\,m}{20\,s} = -30\,m/s$

13. What was the car's speed at 85 s? 13. $30\,m/s$ $v = |\text{slope}|$

14. What was the average velocity of the car up to 95 s? 14. $\frac{\vec{d}}{t} = \frac{-600\,m}{95\,s} = -6.3\,m/s$

15. What was the average speed of the car up to 95 s? 15. $\frac{d}{t} = \frac{1800\,m}{95\,s} = 18.9\,m/s$

Homework: d-t graph # 2