

Review Chapter 4

Part A: Terms

Define the following terms related to motion.

1. speed: describes how quickly an object moves, calculated by dividing the distance traveled by the time takes
2. average speed: the total distance divided by the total time for a trip
3. instantaneous speed: the actual speed of a moving object at any moment.
4. velocity: a variable that tells you both speed and direction
5. constant speed: speed that stays the same and does not change
6. slope: the ratio of the rise (vertical change) to the run (horizontal change) of a line on a graph
7. acceleration: the rate at which velocity changes

Part B: Speed and Velocity

Answer the following questions related to speed and velocity.

8. What is the difference between speed and velocity?

Velocity has both a magnitude + direction, while speed only has a magnitude.

9. Finish the following equations:

$v = \frac{d}{t}$ - speed

$v = \frac{d}{t} + \text{direction}$ - velocity

10. A high-speed train travels at 300 km/h. How long (in hours) would it take the train to travel 1,800 km at this speed?

$v = 300 \text{ km/h}$
 $d = 1,800 \text{ km}$
 $t = ?$

$300 = \frac{1,800}{t} = \frac{1,800}{300} = \boxed{6 \text{ hrs}}$

11. A cyclist has an average speed of 33.6 km/h in the 15th stage of the Tour de France, which took 4.00 hours. How far (in km) did he travel in the race?

$v = 33.6 \text{ km/h}$
 $t = 4 \text{ hrs.}$
 $d = ?$

$v = \frac{d}{t}$

$33.6 = \frac{d}{4}$

$(33.6)(4) = d$

$\boxed{134.4} = d$
 Km

12. You are driving to your friends house which is 5.0 miles west of where you are. If it takes you 15 minutes, what is the average velocity that you traveled?

$v = ?$ $t = 15 \text{ min}$
 $d = 5 \text{ miles - west}$

$V = \frac{d}{t}$

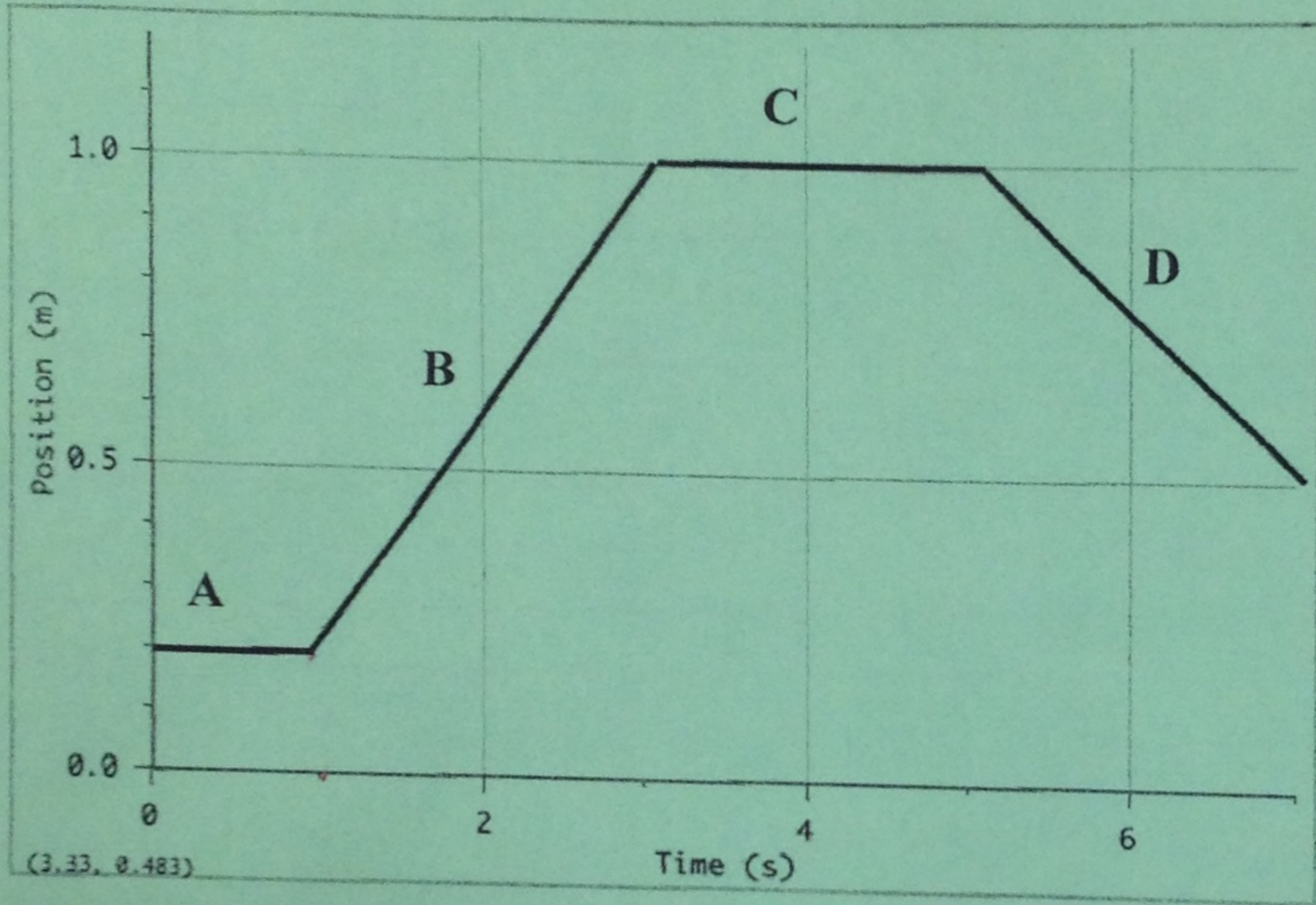
$V = \frac{5}{15} =$

$\frac{.3}{\cancel{2.5} \text{ mi/min, west}}$

Part C: Motion Graphs

Answer the following questions involving motion graphs.

13. Below is a graph of a person walking. Answer the following questions using the graph below.



a. Describe the person's motion during segment A.

Not moving for 1 sec. (.25 m away)

b. Describe the person's motion during segment B.

moving forward for 2 secs.

c. Describe the person's motion during line segment C.

not moving for 2 secs. (1.0 m away)

d. Describe the person's motion during line segment D.

moving backwards for 2 sec.

e. What is the independent variable on the graph?

Time (s)

f. What would the slope represent on this graph?

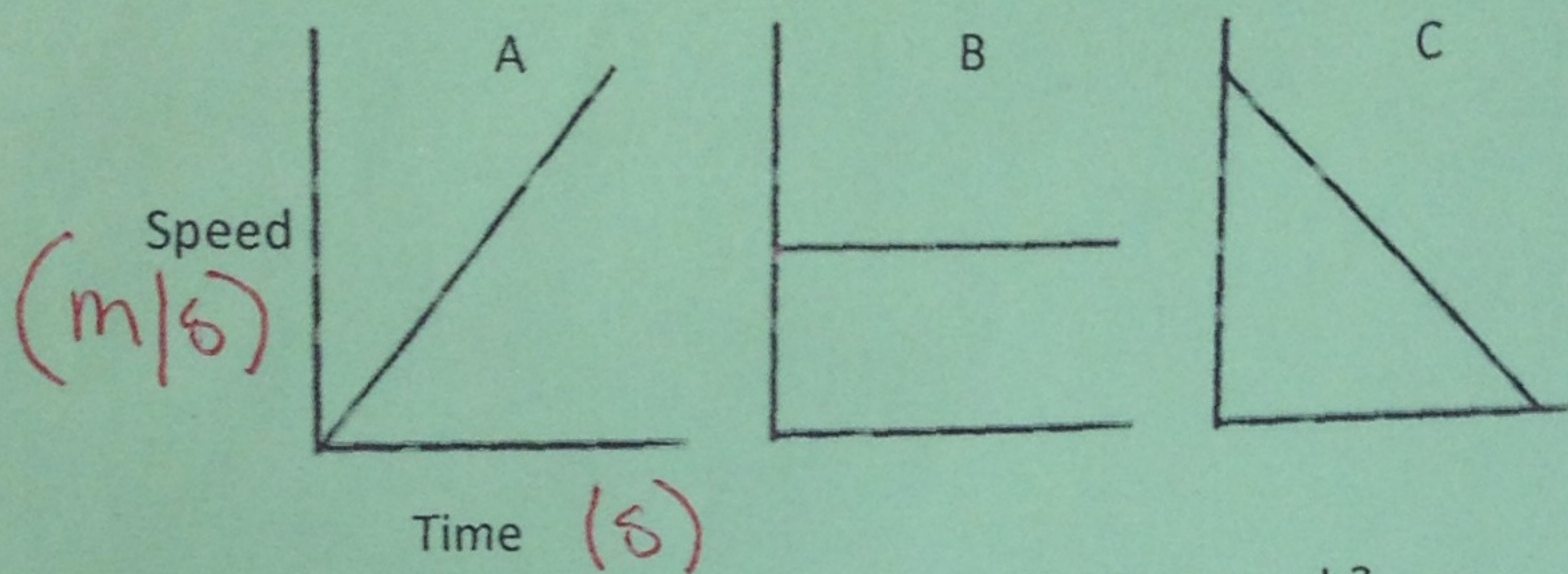
slope = speed $\frac{m}{s}$

g. Which segment on this graph represents the fastest speed of the walker?

Letter B

slope is greatest.

14. Use the graph below to answer the following questions (all of the graphs are speed vs. time):



a. What does the slope represent on a speed vs. time graph?

acceleration $\left(\frac{m/s}{s}\right)$

b. Which graph represents constant acceleration?

A

c. Which graph represents negative acceleration?

C

d. Which graph represents zero acceleration?

B

Part D: Acceleration

Answer the following questions relating to acceleration.

15. What is the equation for acceleration?

$$a = \frac{v_2 - v_1}{t}$$

$$a = \frac{v_f - v_i}{t}$$

16. A roller coaster car rapidly picks up speed as it rolls down a slope. As it starts down the slope, its speed is 4 m/s. But 3 seconds later, at the bottom of the slope, its speed is 22 m/s. What is its average acceleration?

$$v_1 = 4 \text{ m/s}$$

$$v_2 = 22 \text{ m/s}$$

$$t = 3 \text{ sec.}$$

$$a = \frac{v_2 - v_1}{t}$$

$$a = \frac{22 - 4}{3} = \boxed{6 \text{ m/s}^2}$$

17. A cyclist accelerates from 0 m/s to 8 m/s in 3 seconds. What is his acceleration? Is this acceleration higher than that of a car which accelerates from 0 to 30 m/s in 8 seconds? — NO.

①

$$a = ?$$

$$v_1 = 0 \text{ m/s}$$

$$v_2 = 8 \text{ m/s}$$

$$t = 3 \text{ sec.}$$

$$a = \frac{v_2 - v_1}{t}$$

$$a = \frac{8 - 0}{3} = \boxed{2.67 \text{ m/s}^2}$$

1st cyclist

② $a = ?$

$$v_1 = 0 \text{ m/s}$$

$$v_2 = 30 \text{ m/s}$$

$$t = 8 \text{ s.}$$

$$a = \frac{v_2 - v_1}{t}$$

$$a = \frac{30 - 0}{8}$$

$$\boxed{a = 3.75 \text{ m/s}^2}$$