SPH3U – Unit 1 Kinematics

Comparing Graphs of Linear Motion

Linear Motion

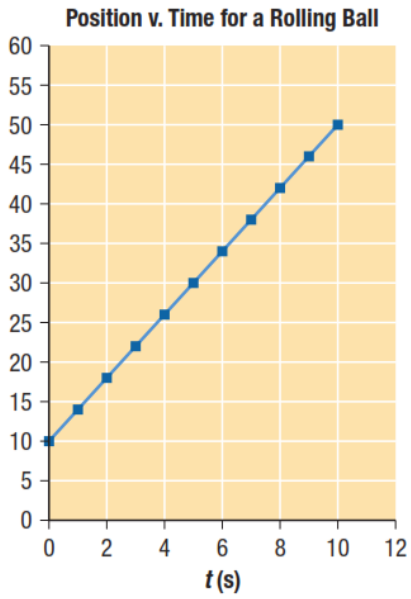
1 dimension

- Motion along a straight line
- Can be described mathematically using only 1 dimension. (in the x-direction, in the y-direction, North, East, etc.)
- Also called rectilinear motion (Rectilinear propogation of light in Gr. 10 optics)

Position-time Graph (Constant Velocity)

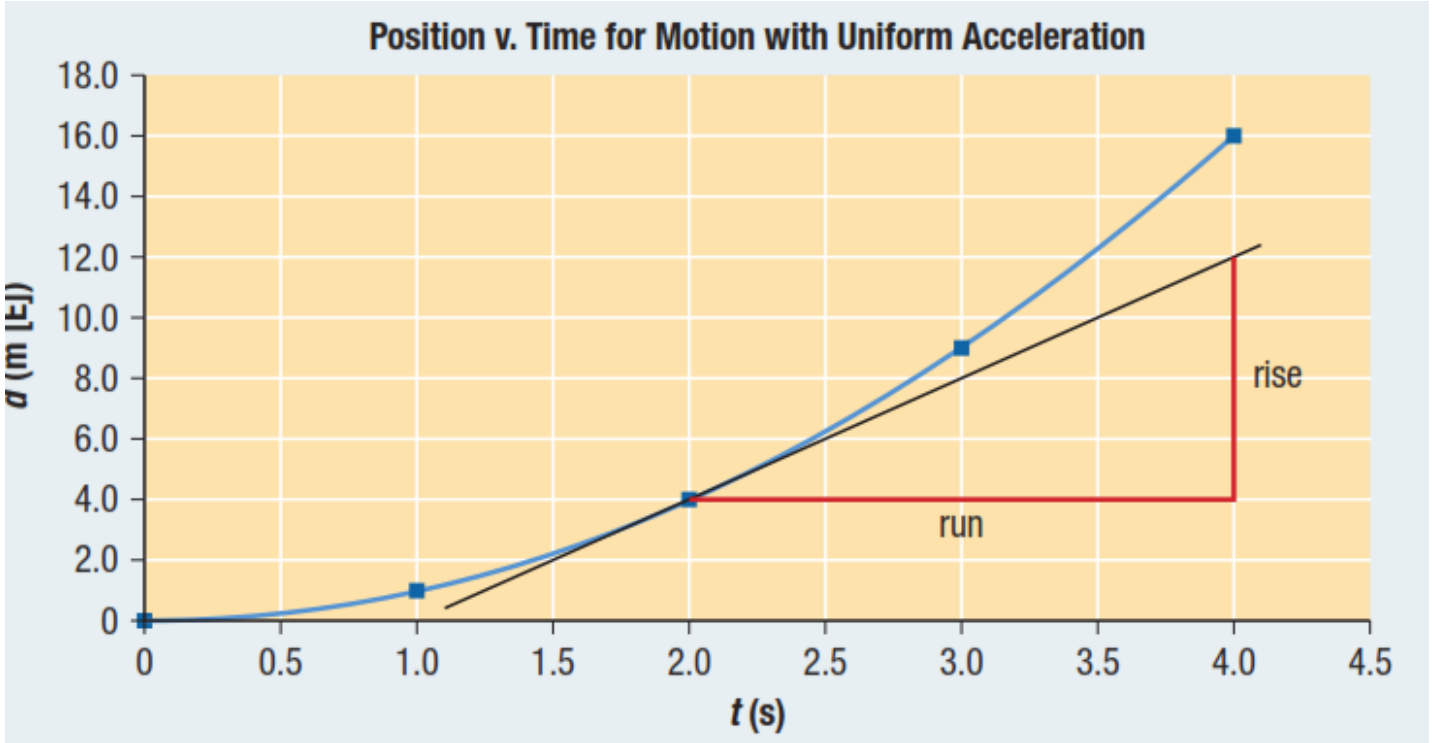
- A graph describing the motion of an object, with position on the vertical axis and time on the horizontal axis

- The slope of a position-time graph gives the velocity of the object



Position-Time Graph (Uniform Acceleration)

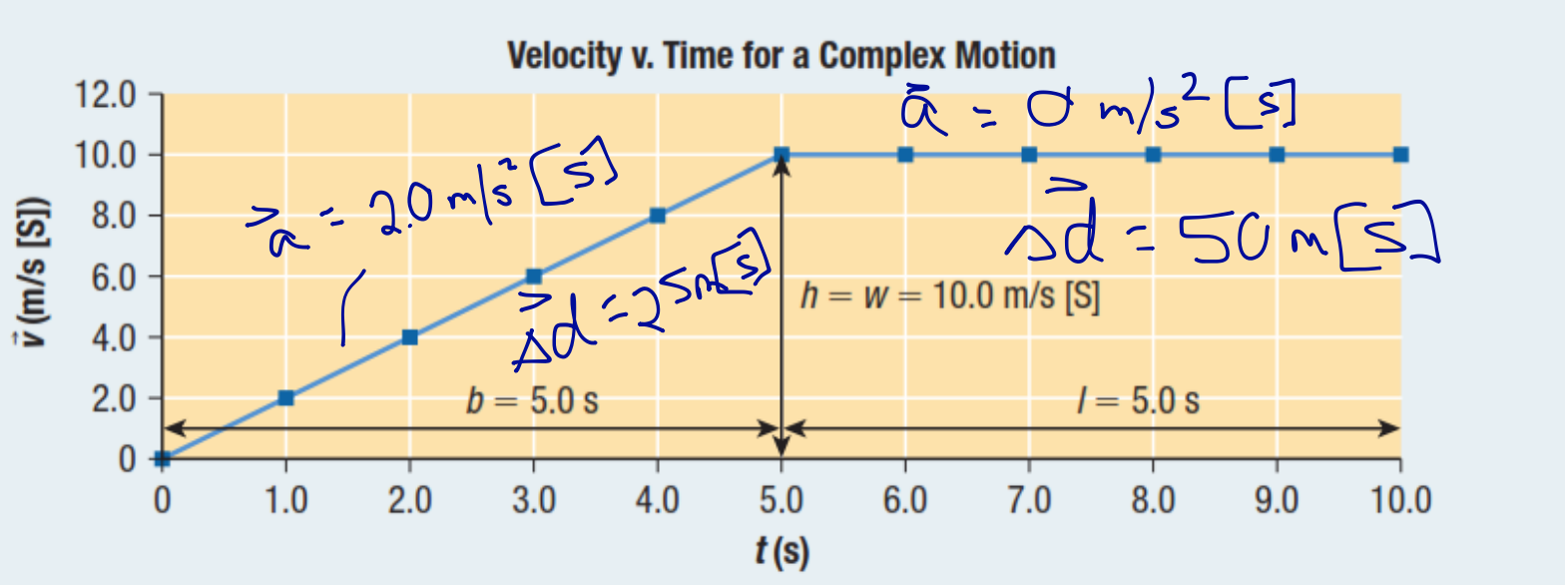
- Instantaneous velocity of an object is its velocity at a specific instant in time. It is equal to the slope of the tangent to the position-time graph at that instant in time



Velocity-Time Graph

- A graph describing the motion of an object, with velocity on the vertical axis and time on the horizontal axis
- The slope of a velocity-time graph gives the average acceleration of an object
- The area under a velocity-time graph gives the displacement of the object whose motion it describes

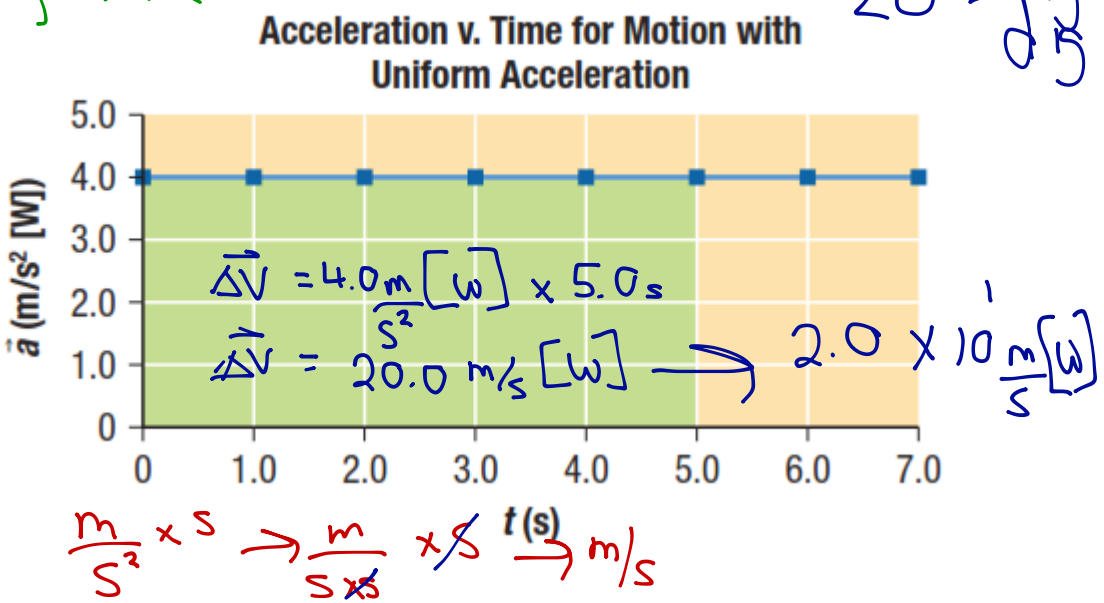
VELOCITY-TIME GRAPH



ACCELERATION-TIME GRAPH

- A graph describing the motion of an object with acceleration on the vertical axis and time on the horizontal axis
- The area under an acceleration-time graph represents the change in velocity of an object.

$A = l \times w$

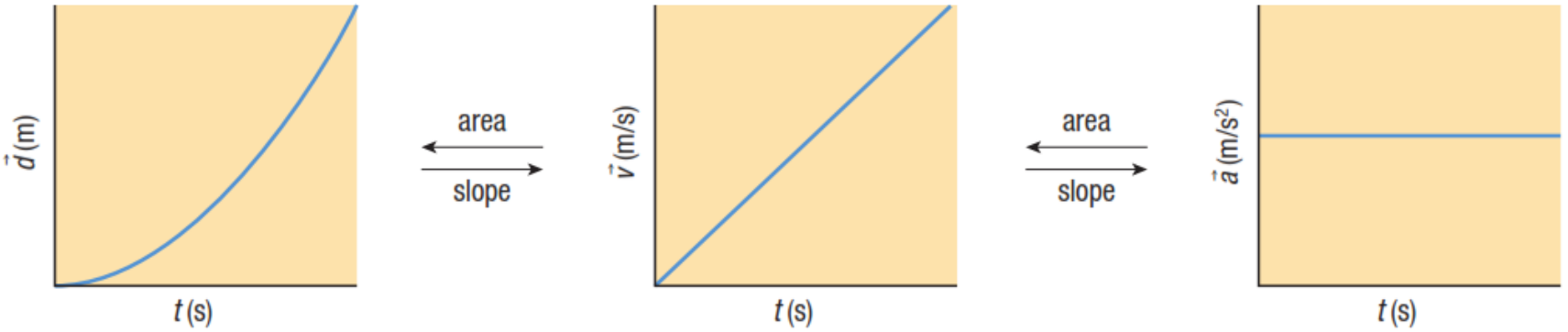


20 1 sig fig

$2.0 \times 10^{1} \frac{m}{s}[W]$

Relationships between linear motion graphs

- Given one type of motion graph, you can read or calculate data from it in order to construct a different type of graph



Relationships between linear motion graphs

How do you determine …	Given a …	Read information from graph	Take the slope	Find the area
position	position–time graph	✓		
velocity	position–time graph		✓	
velocity	velocity–time graph	✓		
velocity	acceleration–time graph			✓
acceleration	velocity–time graph		✓	
acceleration	acceleration–time graph	✓		

Pg. 35 #3

3. Consider the position–time graph shown in **Figure 10**. T/I
   (a) What is the position of the object at $t = 5.0$ s?
   (b) What is the instantaneous velocity of the object at $t = 3.0$ s?
   (c) What is the average velocity for the object's motion from 0 s to 6.0 s?

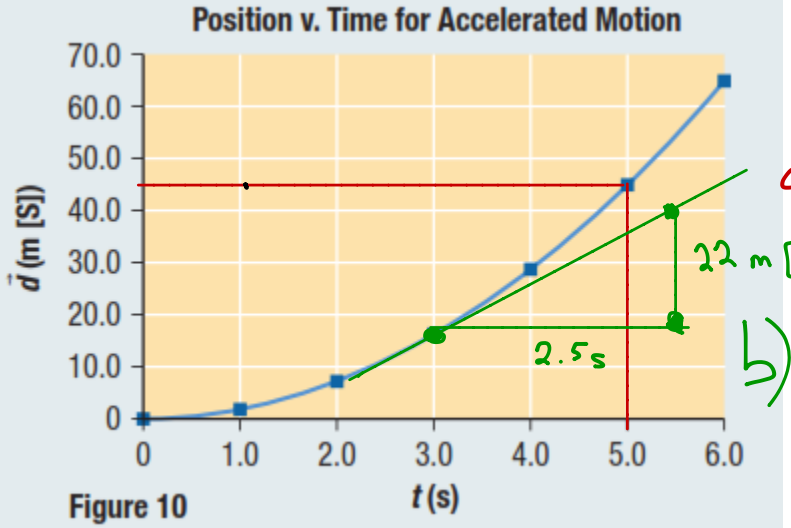


Figure 10

a) 45 m [S]

b) $\vec{V}_{inst} = \frac{22\,m[S]}{2.5\,s}$

$\vec{V}_{inst} = 8.8\,\frac{m}{s}[S]$

c) $\vec{V}_{avg} = \frac{\vec{\Delta d}}{\Delta t}$

$= \frac{\vec{d}_2 - \vec{d}_1}{t_2 - t_1}$

$= \frac{65\,m[S] - 0\,m[S]}{6\,s - 0\,s}$

$= \frac{65\,m[S]}{6\,s}$

$= 10.8\,m/s\,[S]$

$= 11\,m/s\,[S]$

Homework

- Pg. 30 #11 (#4-10 if you didn't complete last night)
- Pg. 35 #2,4
- Read 1.5 – pages 36 - 39

Quiz – d-t, v-t graphs

$$\vec{a} = \frac{\vec{v}_2 - \vec{v}_1}{t}$$