Calculus AB

2-2a

(Day 2)

Position

(Thomas Handout)

Give the positions $s = f(t)$ of a body moving on a coordinate line, with s in meters and t in seconds.

(a) Find the body's displacement and average velocity for the given time interval.

(b) Fine the body's speed an acceleration at the endpoints of the interval.

(c) When if ever during the time interval does the body change direction?

1) $s = t^2 - 3t + 2$, $[0,2]$

$s(0) = 2$
$s(2) = 0$ displacement: 2

Vave $\frac{0-2}{2-0} = -1$ $\frac{s(2)-s(0)}{2-0}$

b) speed $|v|$ $v(t) = 2t-3$ $v(0) = -3$ $v(2) = 1$ $a(t) = 2$ $a(0) = 2$ $a(2) = 2$

c) Find $v(t) = 0$

$2t - 3 = 0$
$2t = 3$
$t = 1.5$

9) Explorers on a small airless planet used a spring gun to launch a ball bearing vertically upward from the surface at a launch velocity of 15 m/sec. Because the acceleration of gravity at the planet's surface was g_s m/sec^2, the explorers expected the ball bearing to reach a height of $s = 15t - \frac{1}{2}g_s t^2$ meters t seconds later. The ball bearing reached its maximum height 20 sec after being launched. What was the value of g_s?

$s = 15t - \frac{1}{2}g_s t^2$

$v(t) = 15 - g_s t$

$0 = 15 - g_s(20)$

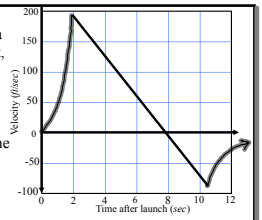
$20g_s = 15$

$g_s = \frac{15}{20} = 0.75 \ m/sec^2$

15)

When a model rocket is launched, the propellant burns for a few seconds, accelerating the rocket upward. After burnout, the rocket coasts upward for a while and then begins to fall. A small explosive charge pops out a parachute shortly after the rocket starts down. The parachute slows the rocket to keep it from breaking when it lands.

The figure shows the velocity data from the flight of the model rocket. Use the data to answer:



a) How fast was the rocket climbing when the engine stopped? ≈190 ft/sec

b) For how many seconds did the engine burn? 2 sec

c) When did the rocket reach its hightest point? What was its velocity then? 8sec, v = 0

d) When did the parachute pop out? How fast was the rocket falling then? 10.5sec 85 ft/sec

e) How long did the rocket fall before the parachute opened? 2.5sec

f) When was the rockets acceleration the greatest? 1.99 sec

g) When was the acceleration constant? What was its value then?

(2, 10.5) $\frac{-90-190}{10.5-2} = -32.941$

Assignment:

Thomas Handout
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2-12 all, 14, 16,
22, 23, 24, 25