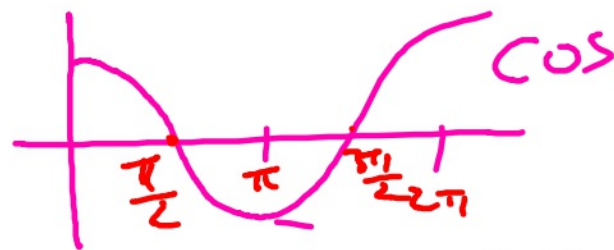


Good afternoon: Warm up

If $f(x) = \sin(x^2 + \pi)$, then $f'(\sqrt{2\pi}) =$

$$f'(x) = \cos(x^2 + \pi) \cdot 2x$$



- (A) $-2\sqrt{2\pi}$ (B) -2 (C) -1 (D) $\cos(2\sqrt{2\pi})$

$$f'(\sqrt{2\pi}) = \frac{\cos(2\pi + \pi)}{\cos(3\pi)} \cdot 2\sqrt{2\pi} = \cos(\pi) \cdot 2\sqrt{2\pi}$$

The function g is defined by $g(x) = x^2 + bx$, where b is a constant. If the line tangent to the graph of g at $x = -1$ is parallel to the line that contains the points $(0, -2)$ and $(3, 4)$, what is the value of b ?

$$\rightarrow y - y_1 = m(x - x_1)$$

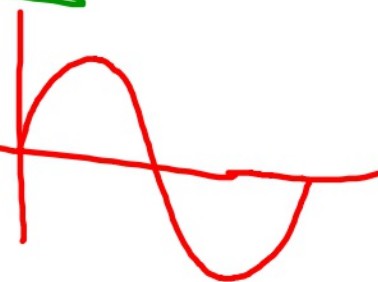
- (A) -1 (B) 2 (C) $\frac{5}{2}$ (D) 4

$$g'(x) = 2x + b$$

$$g'(-1) = 2 = -2 + b$$

$$\underline{\underline{b = 4}}$$

$$m = \frac{6}{3} = 2$$

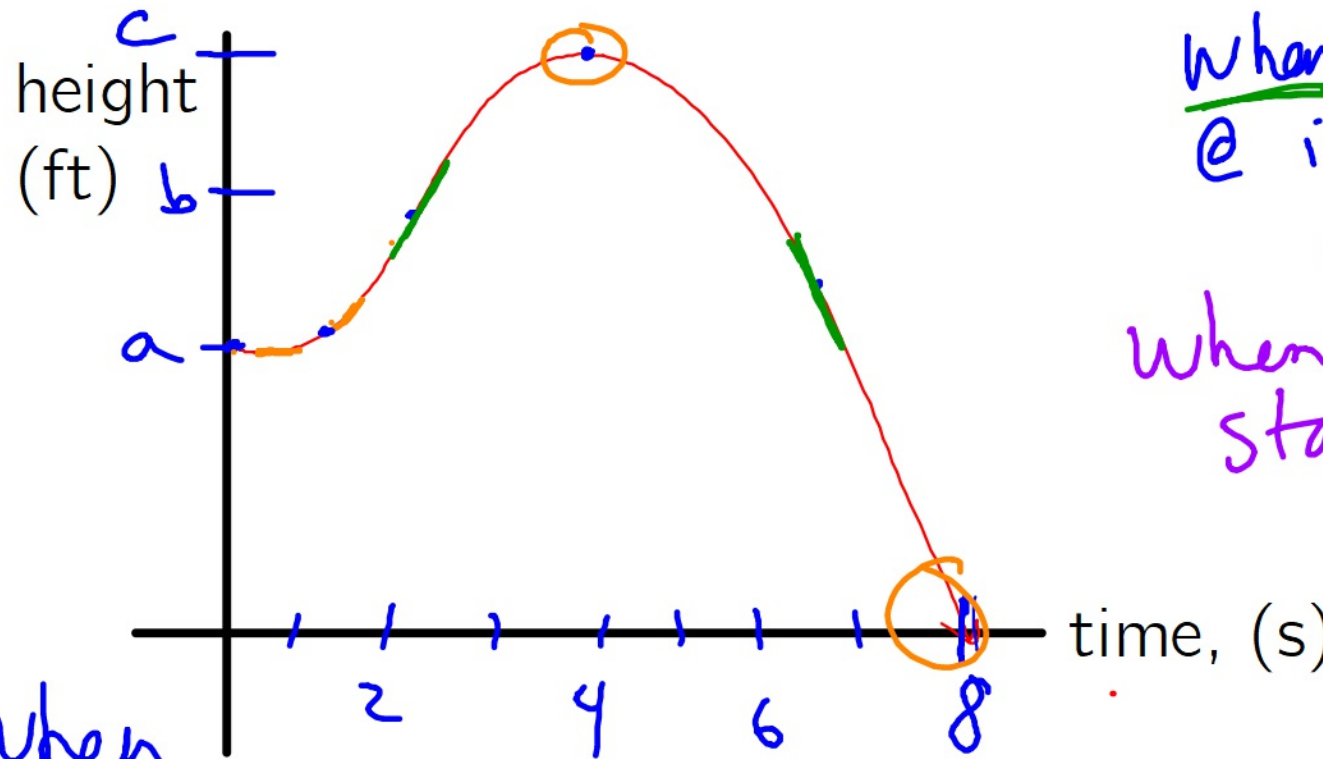


AP Packet: Turn in by end of day ~~tomorrow~~
Th.

Will be returned with ✓ X

(notes)

Position-Velocity-Acceleration



When is the object moving the fastest?
@ $t = 6$

When is the object @ its greatest height?
@ $t = 4$

When is the object standing still?
@ $t = 4$.

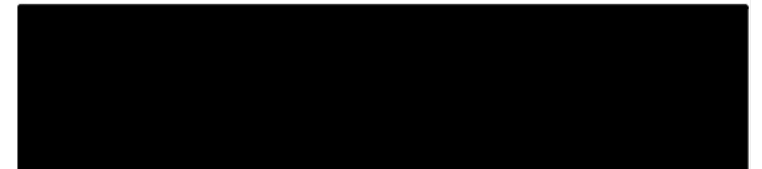
What's happening @ $t = 8$?
lowest height hitting the ground.

"Higher Order Derivatives": 2nd derivative, 3rd derivative, etc.

Notation:

Function	Derivative	2nd Deriv.	3rd Deriv
y	y'	y''	y'''
$f(x)$	$f'(x)$	$f''(x)$	$f^{(3)}(x)$
y	$\frac{dy}{dx}$	$\frac{d^2y}{dx^2}$	$\frac{d^3y}{dx^3}$

$$\frac{d}{dx} \left(\frac{d}{dx} y \right)$$



How do we talk about "where" something is (position)?

What unit?

distance (ex. miles)

What units do we talk about speed in?

$\frac{\text{distance}}{\text{time}}$

rate
of
change

(mph)

How do we describe acceleration?

$\frac{\frac{\text{distance}}{\text{time}}}{\text{time}}$

rate
of
change

($\frac{\text{mph}}{\text{s}}$)

2 time
variables

$\frac{\text{distance}}{\text{time}^2}$

The Motion Hierarchy

	distance/position	$f(x)$	$f(t)$	$s(t)$
take deriv	velocity ("speed")	$f'(x)$	$f'(t)$ $v(t)$	$s'(t)$ $\frac{ds}{dt}$
take deriv.	acceleration	$f''(t)$	$a(t)$ $v'(t)$	$\frac{d^2s}{dt^2}$ $\frac{dv}{dt}$
	jerk (3 rd deriv.)			

V: Hrs

Some helpful comments:

- velocity vs speed:

velocity shows direction via sign (+ means up/right, - means down/left)

- faster vs slower (increasing vs decreasing speed):

when velocity and accel (aka, slope of velocity) are the same sign, speeding up. different signs? slowing down

- "at rest"

velocity = 0

- "changes direction"

sign change in velocity

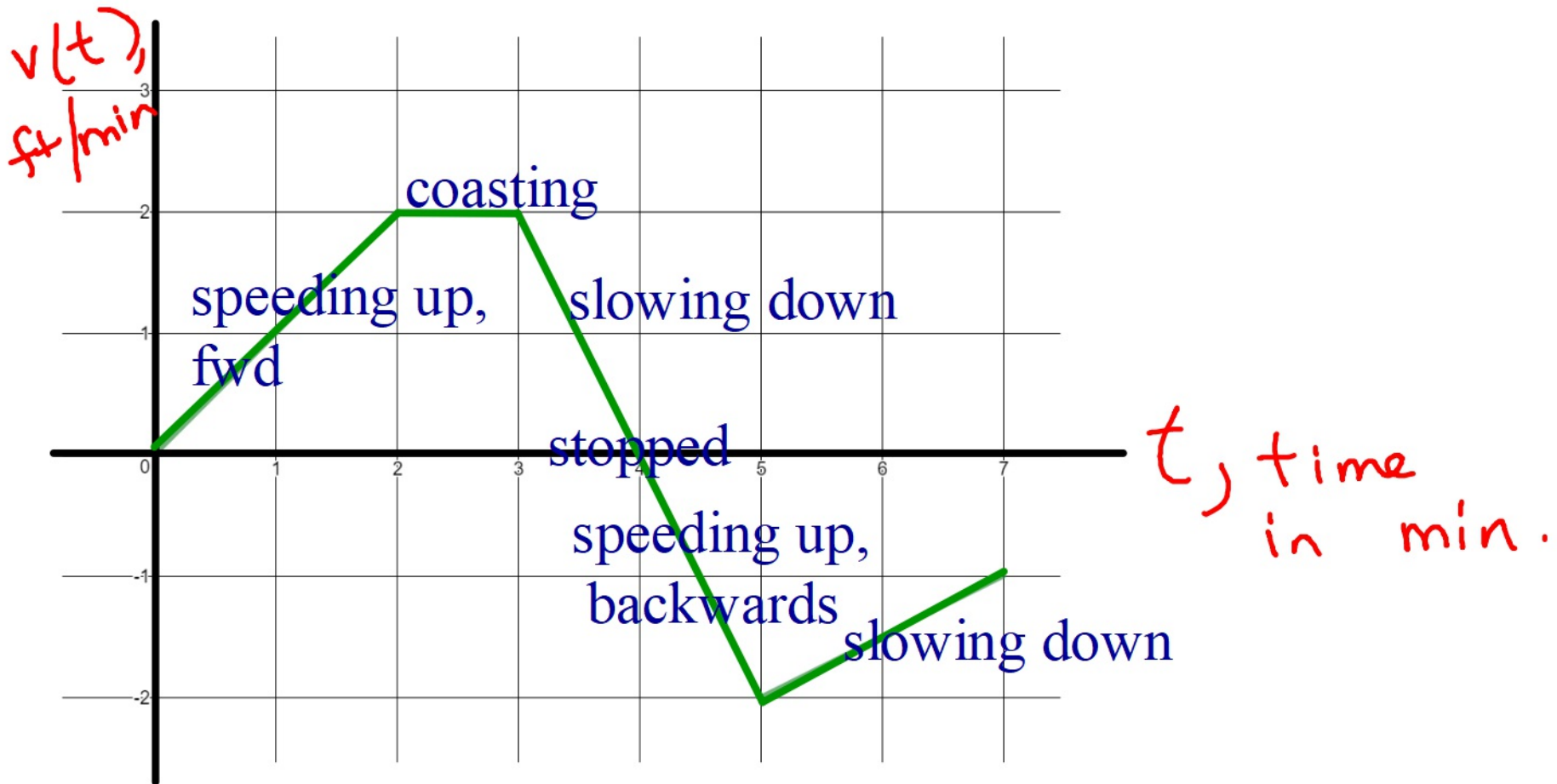
- "displacement"

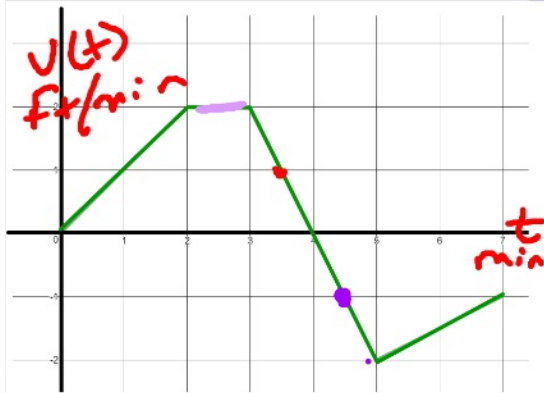
difference in ending position
minus starting position

- "distance traveled"

notice the units of the area!

Reading a Velocity Graph





What is Frumble's velocity at $t=2$?

2 ft/min

When is Frumble on cruise control? $t=2$ to $t=3$
 (no accel \rightarrow slope of vel = 0)

When does Frumble change direction? $(2,3)$
 (sign change in velocity) $t=4$

Is Frumble speeding up or slowing down at $t=3.5$?

(Sign of vel. vs. sign of accel.)

When is Frumble farthest from his starting position?

$t=4$ (changed direction then, went back after)

How far is Frumble from when he started?

f.b.d.

HW:
Finish
packet

To summarize:

HW due Thursday
handout, evens