# Good afternoon: warm up in notebooks

Suppose a moving object's position s, in feet, for any time t in seconds is modeled by $s(t) = -3t^2+12t+4$. ft

$v(t) = -6t+12$ ft/s

$a(t) = -6$ ft/s/s

1. When is the object at rest?

$v(t) = 0 = -6t+12 \Rightarrow t = 2$ sec

2. Is the object speeding up or slowing down at t=3?

$v(3)$? $a(3)$? $v(3) = -6$ ft/s

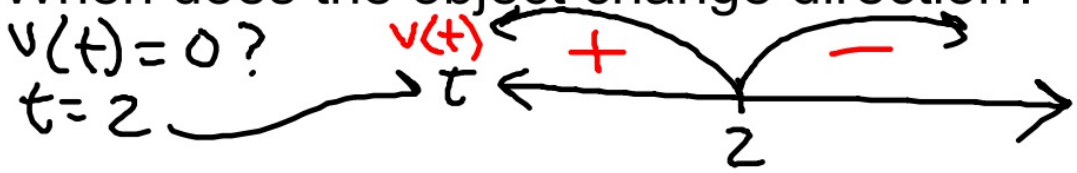
Speeding up

$a(3) = -6$ ft/s/s

3. When does the object change direction?

$v(t) = 0$?

$t = 2$

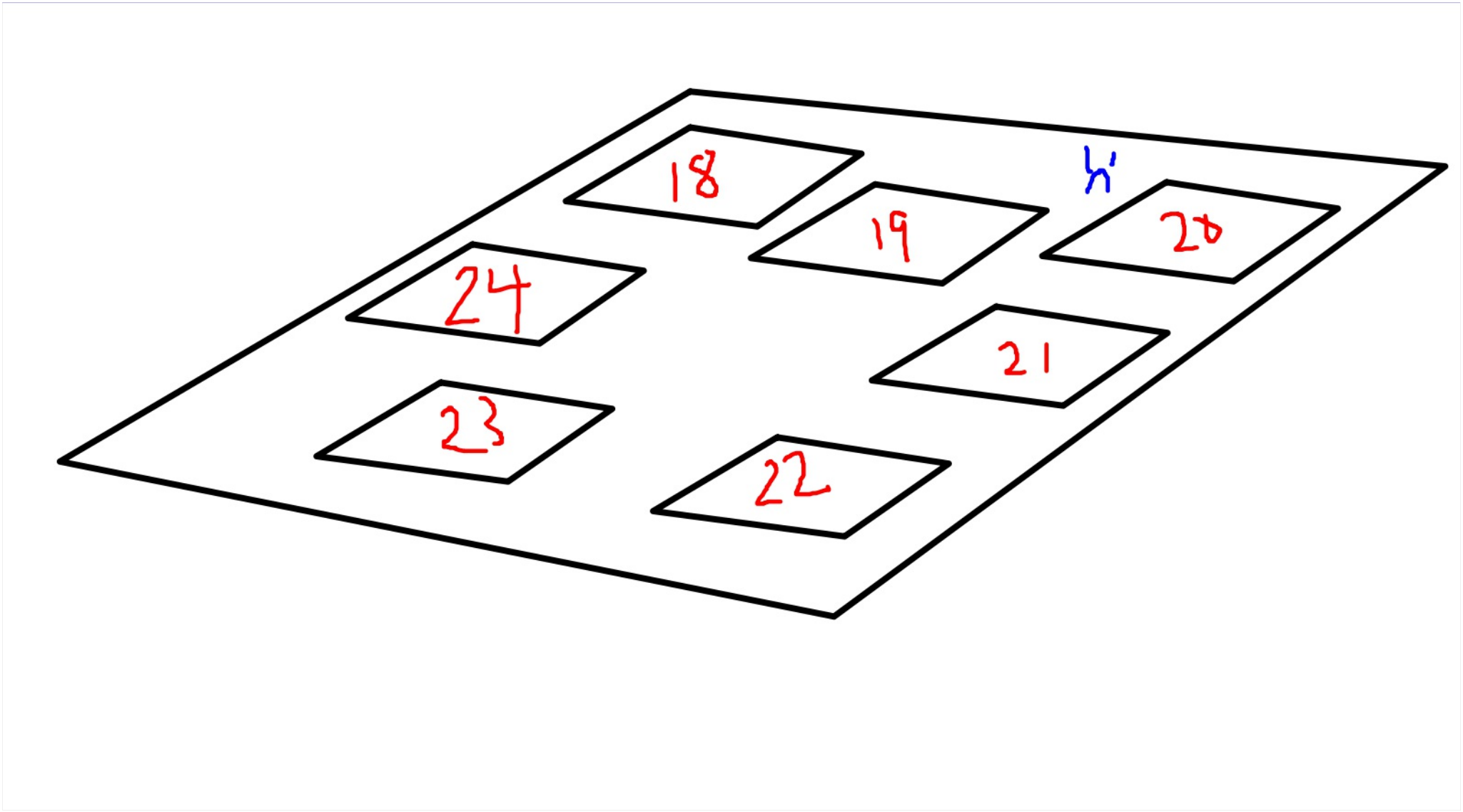



* 4. When the object hits the ground, what is its velocity? (use a calc)

$v(?) = -13.86$ ft/s

$s(t) = -3t^2+12t+4 = 0$

$t = 4.31$

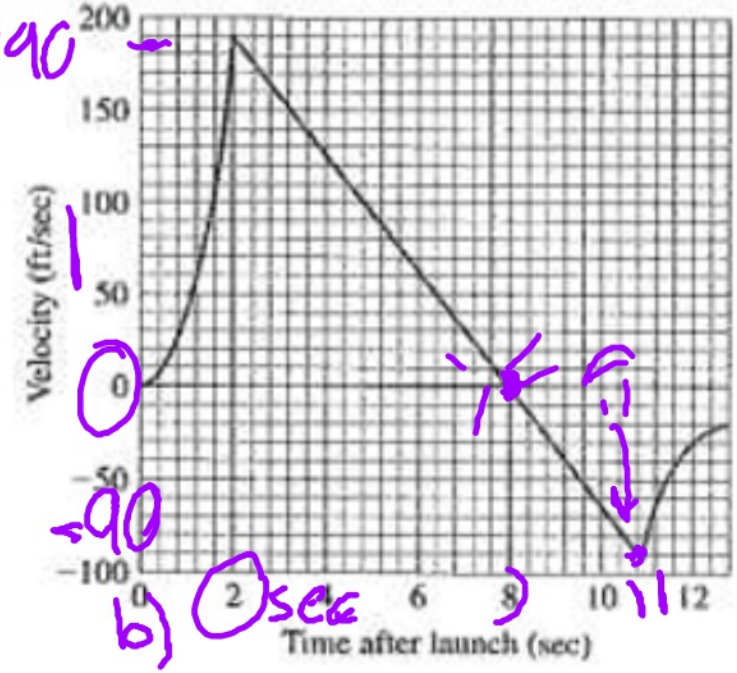

18
19
20
24
21
23
22

Work on each problem with your group

Select someone to lead the discussion for the class

and then begins to fall. A small explosive charge pops out a parachute shortly after the rocket starts downward. The parachute slows the rocket to keep it from breaking when it lands. This graph shows velocity data from the flight.






Use the graph to answer the following.

a) $s(0) = 2$ $s(5) = 12$ 10m $s(t) = t^2 - 3t + 2$

b) $10/5 = 2$ $v(t) = 2t - 3$

$a(t) = 2$

c) $v(4) =$ 5 m/s

d) $a(4) =$ 2 m/s/s

e) $0 =$ 1 1/2 sec

f) $(t-1)(t-2)$

1 sec, 2 sec

#19

$v(t) = -3t^2 + 14t - 14$

$a(t) = -6t + 14$

#20

$-.85$ , $-5.51$

#21

$(t-2)^2(t+4)$

(a) $3t^2-16t+20$

(b) $6t-16$

(c) $2, 10/3$

(d) ↓

#22 $t^3 - 6t^2 + 8t + 2$

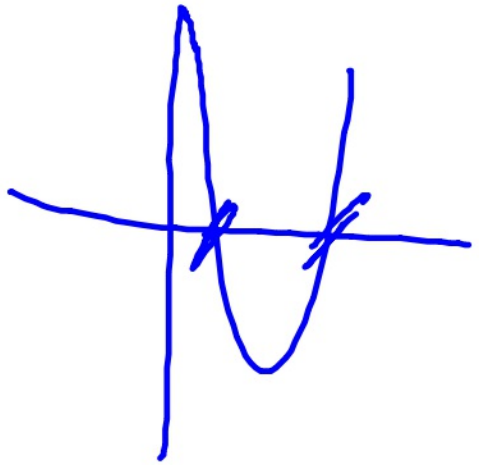
a) $3t^2 - 12t + 8$

b) $6t - 12$

c) $0 = 3t^2 - 12t + 8$

3.15, .85 sec

d) ↓



#23

$s = t^3 - 6t^2 + 9t$

$s' = 3t^2 - 12t + 9 = 0$

$3(t-3)(t-1)$

$3 \quad 1$

$s'' = 6t - 12$

$s''(3) = 6\ m/s^2$

$s''(6) = -6\ m/s^2$

#24 $v = 2t^3 - 9t^2 + 12t - 5$

$a(t) = 6t^2 - 18t + 12 = 0$

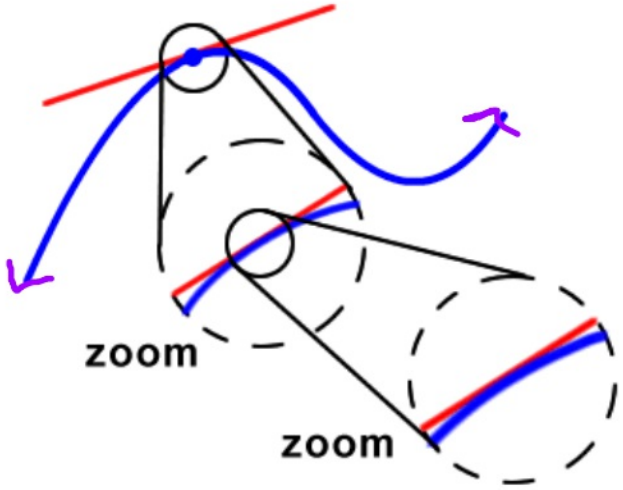
$t^2 - 18t + 72$

$6(t-12)(t-6)$

$(t-2)(t-1)$ $t = 1, 2$

0 m/sec 1 m/sec

# Linearization and Approximation




"locally linear"

Estimate ~~sqrt(63)~~

$\sqrt{63}$

① Identify a function

$y = \sqrt{x}$

② find a "known" value near the weird number.

$\sqrt{64} = 8 \Rightarrow (64, 8)$

③ use the known value to write a tangent line

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

④ Put weird number in for x.

$y - 8 = m(x - 64)$

$\uparrow$ ?

$y = \sqrt{x} = x^{\frac{1}{2}}$

$y' = \frac{1}{2}x^{-\frac{1}{2}} \Rightarrow \frac{1}{2\sqrt{x}}$

$y'(64) = \frac{1}{2\sqrt{64}} = \frac{1}{2 \cdot 8} = \frac{1}{16}$

$y - 8 = \frac{1}{16}(x - 64)$

$y - 8 = \frac{1}{16}(63 - 64)$

$y - 8 = \frac{1}{16}(-1)$

$y - 8 = -\frac{1}{16}$

$y = 8 - \frac{1}{16} \Rightarrow \boxed{7\frac{15}{16}}$

Estimate $\sqrt[3]{127}$

$y = \sqrt[3]{x} = x^{1/3}$

$y' = \frac{1}{3}x^{-2/3} \Rightarrow \frac{1}{3x^{2/3}} \Rightarrow \frac{1}{3(\sqrt[3]{x})^2}$

$y'(125) = \frac{1}{3(\sqrt[3]{125})^2} = \frac{1}{3(5)^2} = \frac{1}{75} \leftarrow m$

$(125, 5)$

$y - 5 = \frac{1}{75}(x - 125)$

$127$

$y - 5 = \frac{1}{75}(2)$

$y = 5\frac{2}{75}$

Worksheet is HW

#1-8