- $f(x) = x^2$, $g(x) = -x^3$

- $f(g(x)) = (-x^3)^2 = x^6$

  $h(x) = x+1$

- $f(h(x)) = (h(x))^2 = (x+1)^2$

Common mistakes applying these

- $|x+1|+1 \overset{?}{=} |x+2| \overset{?}{=} |x|+2$ not true!

  $x = -1$

  $|-1+1|+1 = 1$ $\quad |-1+2| = 1$

- $2\ell + 2w = 500 \rightsquigarrow \boxed{\ell = \frac{1}{2}(500 - 2w)}$

  $\frac{2w}{2} = \frac{500-2\ell}{2}$ Try to avoid this

$\boxed{2\ell + 2w = 500}$ •

$\Rightarrow 2\ell + 2w - 2w = 500 - 2w$

$\Rightarrow \boxed{2\ell = 500 - 2w}$

$\Rightarrow \frac{1}{2} \cdot 2\ell = \frac{1}{2}(500 - 2w)$

$\Rightarrow \boxed{\ell = \frac{1}{2}(500 - 2w)}$

$A(\omega, h) = \omega$

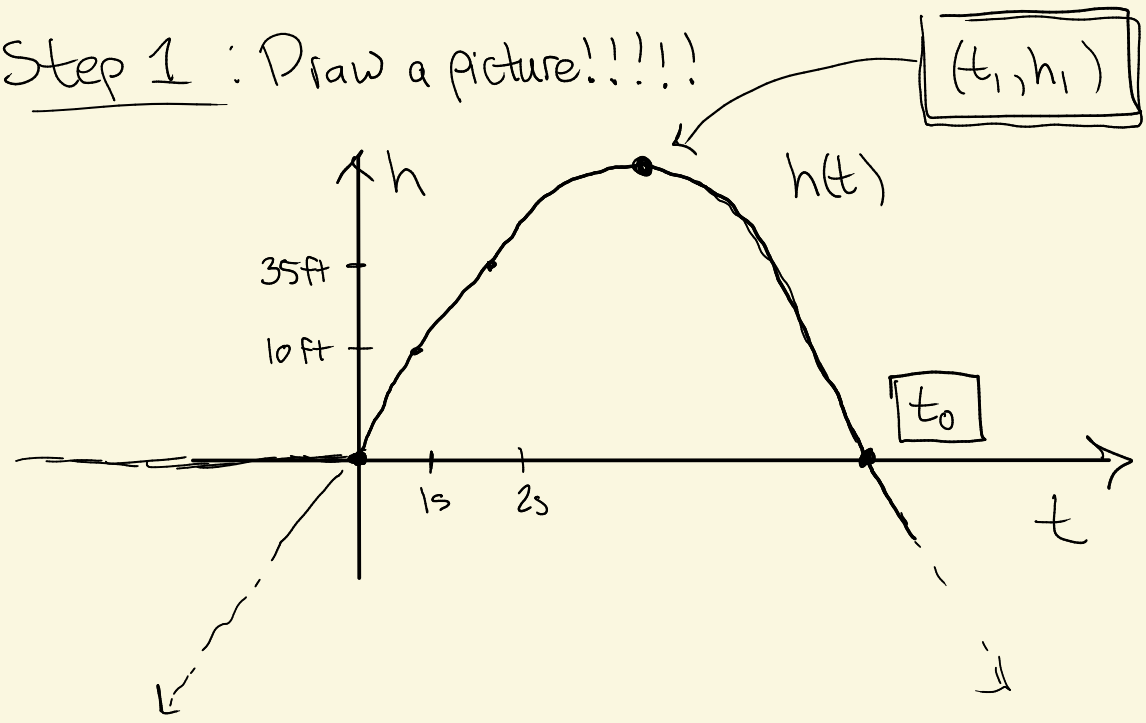
$A = \omega \cdot h$

$A(\omega, h)$

Instructions: Work together in groups of 3 or 4 to complete the following problems.

1. An object is thrown upward. The height, h, in feet, at time t, in seconds, is given by the formula $h(t) = -16t^2 + 96t$.
   (a) Determine the number of seconds required for it to hit the ground.
   (b) Determine the maximum height of the object.
   (c) Determine the time required for the object to reach a height of 50 feet on its way up.

Step 1 : Draw a picture!!!!!



a) When ~~does~~ is it ~~hit~~ on the ground[2].

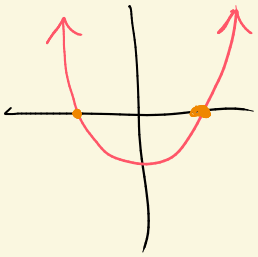
When $h(t) = 0$

$\Rightarrow h(t) = -16t^2 + 96t = 0$

$\Rightarrow -16(t^2 - 6t) = 0$

$\Rightarrow -16t(t-6) = 0$

$\Rightarrow \begin{cases} -16t = 0 & \Rightarrow t = 0 \\ t - 6 = 0 & \Rightarrow \boxed{t = 6} \end{cases}$



$\Rightarrow$ It requires 6 seconds.

b) What is the max height?

$h(t) = -16t^2 + 96t$

$\Rightarrow h(t) = -16(t^2 - 6t)$

$= -16[t^2 - 6t + 9 - 9]$

$= -16[(t-3)^2 - 9]$

Sanity check!

$t^2 - 3t - 3t + 9$

$= t^2 - 6t + 9$

$= -16(t-3)^2 + (16 \cdot 9)$

$\Rightarrow$ Vertex @ $(3, 16 \cdot 9)$. $= (3, 144)$

If you want

c) $h(t) = 50$

$\Rightarrow h(t) = -16t^2 + 96t = 50$

$\Rightarrow -16(t^2 - 6t) = 50$

$\Rightarrow -16[(t-3)^2 - 9] = 50$

$\Rightarrow t = \sqrt{\left(\frac{50}{-16}\right) + 9} + 3.$

5. A rectangle is drawn in the first quadrant with two sides on the coordinate axes and the corner opposite the origin on the line $y = -2x + 3$. Answer the following:

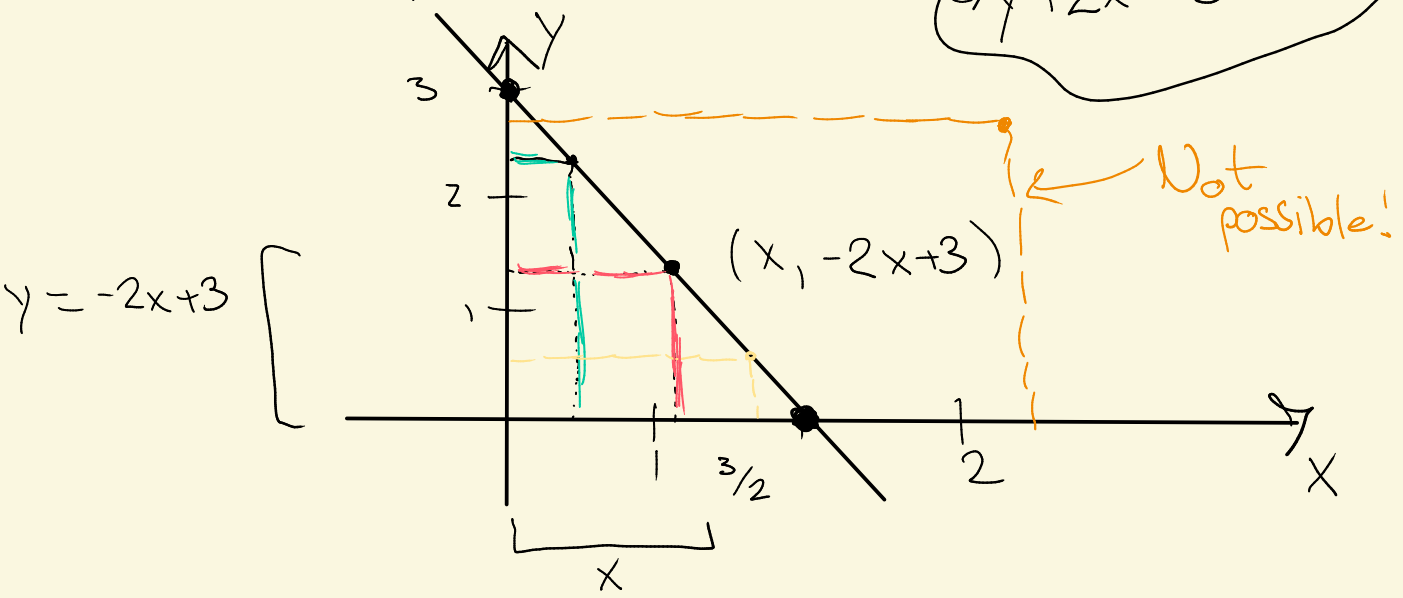
(a) Write the area of the rectangle as a function of x.

(b) For all first quadrant points on the given line, determine the maximum area enclosed by the rectangle.

$y = -2x+3$ (1)

$\Rightarrow y + 2x = 3$

① Draw a picture!!!!!



$A(x,y) = x \cdot y$

$\Rightarrow A(x) = x \cdot (-2x+3)$

$\Rightarrow A(x) = -2x^2 + 3x.$

Steps.

① What's the constraint fn?

② What is the objective fn?

(b) Leave it to you!

7. A tomato grower needs to know when the best time to ship the tomatoes will be. She now has 25 tons on hand and can add two tons a week by waiting. The current profit is \$250 per ton but it will reduce by \$15 per ton for each week she delays. When should she ship to receive maximum profit?

Objective function

$P(?, ?)$

① Draw a "picture"!!

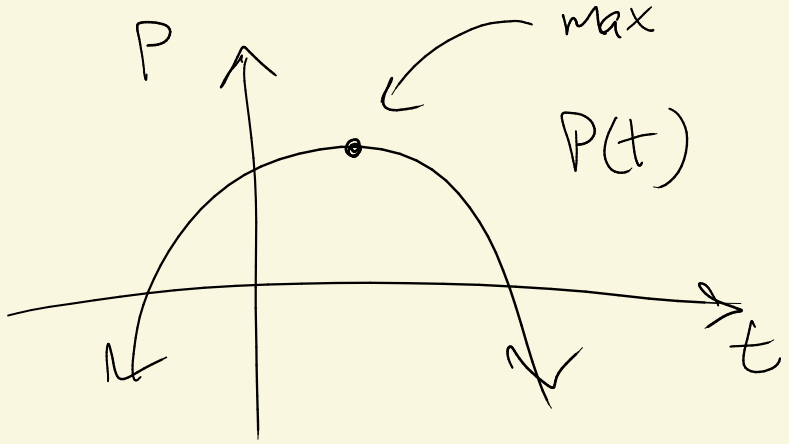
	$t=0$ weeks	$t=1$ week	t weeks
Total Tomatoes	25 tons	25+2 tons	25+2t tons
Total Profit	\$250/ton	\$250/ton − \$15/ton	250 − 15·t

$\hookrightarrow$ $T(t) = 25 + 2t$

$$P(t) = \underbrace{(250 - 15 \cdot t)}_{\$/\text{ton}} \underbrace{T(t)}_{\cdot\ \text{tons}} = \$$$

$$\Rightarrow P(t) = (250 - 15 \cdot t)(25 + 2t)$$

$$= -30t^2 + 125t + 6250$$



$\hookrightarrow$ Leave the rest to you!