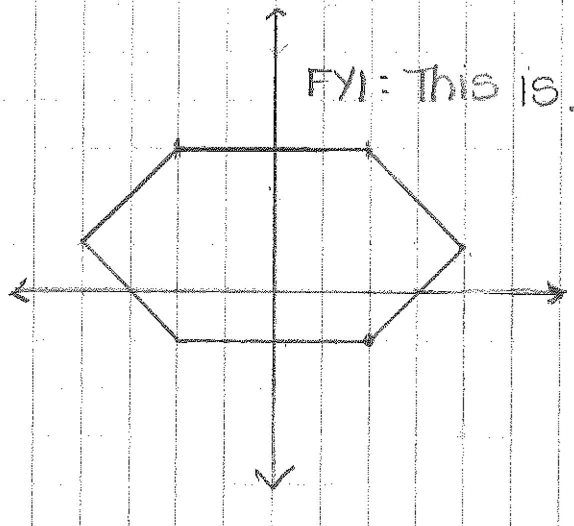
① One example:



FYI: This is not a regular hexagon.

$y = 3 \quad \{-2 \le x \le 2\}$

$y = -1 \quad \{-2 \le x \le 2\}$

$y = -x + 5 \quad \{2 \le x \le 4\}$

$y = x + 5 \quad \{-4 \le x \le -2\}$

$y = x - 3 \quad \{2 \le x \le 4\}$

$y = -x - 3 \quad \{-4 \le x \le -2\}$

② Constraints

Assembly time: $\frac{5}{2}x + 1y \le 20$

Buffing time: $3x + 3y \le 30$

Crate time: $1x + 2y \le 16$

Optimization EQ

$P = 3x + 4y$

Five Pts: $(0,0)$

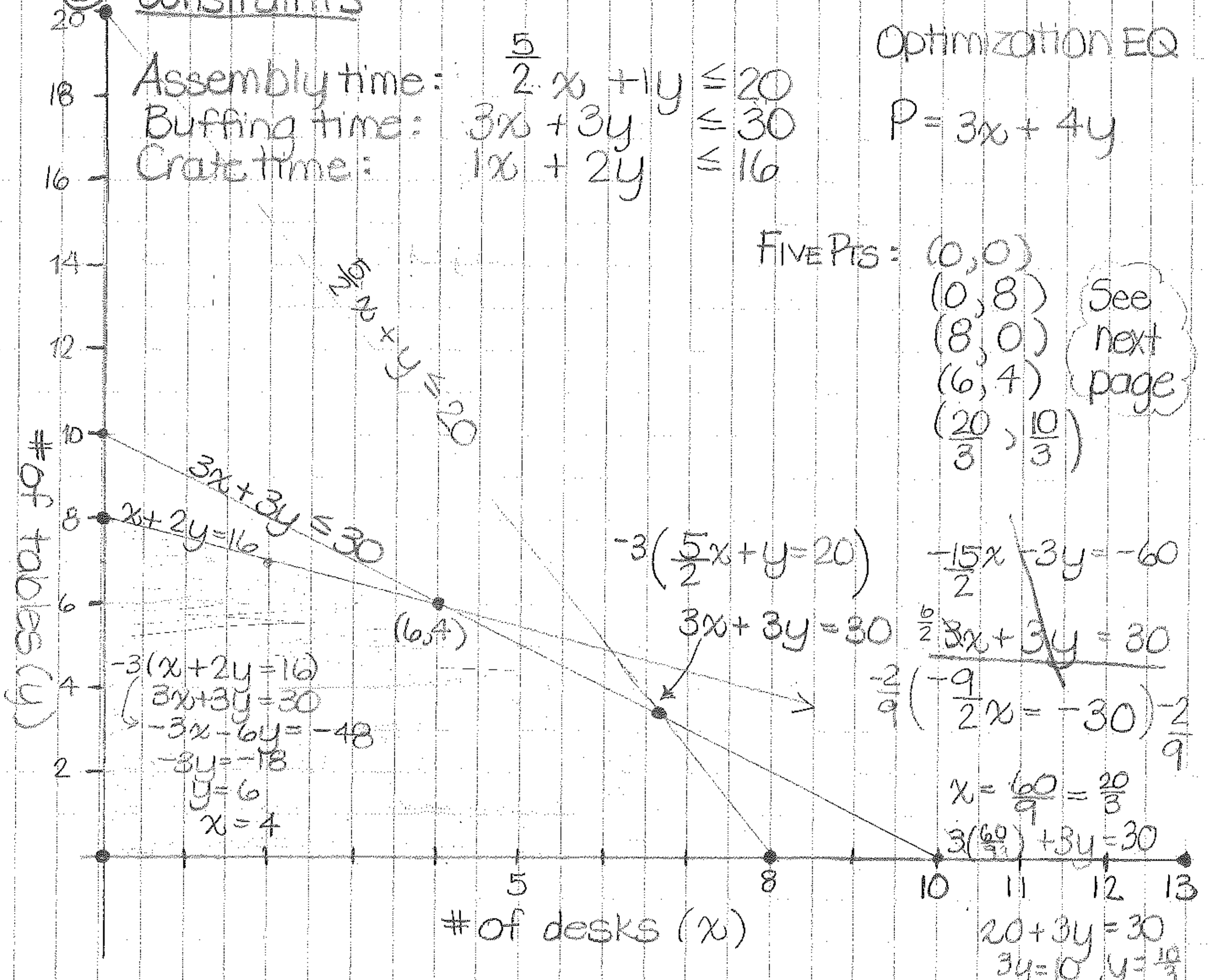
$(0,8)$

$(8,0)$

$(6,4)$

$\left(\frac{20}{3}, \frac{10}{3}\right)$

See next page



$-3\left(\frac{5}{2}x + y = 20\right)$

$3x + 3y = 30$

$\frac{-15}{2}x - \cancel{3y} = -60$

$\frac{6}{2}3x + \cancel{3y} = 30$

$\frac{-2}{9}\left(-\frac{9}{2}x = -30\right)\frac{-2}{9}$

$x = \frac{60}{9} = \frac{20}{3}$

$3\left(\frac{60}{9}\right) + 3y = 30$

$20 + 3y = 30$

$3y = 10 \quad y = \frac{10}{3}$

$-3(x + 2y = 16)$

$3x + 3y = 30$

$-3x - 6y = -48$

$-3y = -18$

$y = 6$

$x = 4$

~ 2 continued ~ $P=3x+4y$

Test all points against the profit equation.

~~$(0,0)$~~

$(0,8)$ $P=3(0)+4(8)=32$ $\$32$

$(8,0)$ $P=3(8)+4(0)=24$ $\$24$

$(6,4)$ $P=3(6)+4(4)=34$ $\$34$ ✓

$\left(\frac{20}{3},\frac{10}{3}\right)$ $P=3\left(\frac{20}{3}\right)+4\left(\frac{10}{3}\right)=33\frac{1}{3}$ $\$33.33$

You should make 6 desks and 4 tables.

③ $y=a\underbrace{(x-6)^2+90}_{\text{vertex}}$

Solve for a by putting 1 pt into the equation.
I used $(12,0)$

$$0=a(12-6)^2+90$$
$$0=36a+90$$
$$\frac{-90}{36}=\frac{36a}{36}$$
$$a=-\frac{5}{2}$$

New equation is:

$$y=-\frac{5}{2}(x-6)^2+90$$

Now, answer the questions...

(next page)

$$y = -\frac{5}{2}(2-6)^2 + 90$$

$$y = -\frac{5}{\cancel{2}} \cdot \overset{8}{\cancel{16}} + 90 = 50$$ (you could also see this # on the graph)

At 2 sec, he would be 50 ft from the starting line.

$$y = -\frac{5}{2}\left(\frac{13}{2} - \overset{6}{\frac{12}{2}}\right)^2 + 90$$

$$y = -\frac{5}{2}\left(\frac{1}{2}\right)^2 + 90 \Rightarrow -\frac{5}{2}\left(\frac{1}{4}\right) + 90$$

$$-\frac{5}{8} + 90 = \underline{89.4 \text{ ft}}$$

④

Yr since '02	fish pop		
0	1,000	> 101	> 2
1	899	> 103	> 2
2	796	> 105	> 2
3	691	> 107	
4	584		

The second difference is constant, so this is a quadratic function.

$$y = ax^2 + bx + \underset{\underset{1000}{\uparrow}}{c}$$

To find a and b set up a system:

$$\begin{cases} 899 = a(1)^2 + b(1) + 1000 \Rightarrow a + b = -101 \\ 796 = a(2)^2 + b(2) + 1000 \Rightarrow 4a + 2b = -204 \end{cases}$$

→

$$\begin{cases} -2(a+b=-101) \\ 4a+2b=-204 \end{cases} \qquad \begin{array}{r} -2a-\cancel{2b}=202 \\ \underline{4a+\cancel{2b}=-204} \\ 2a=-2 \quad a=-1 \end{array}$$

$$\text{so } -1+b=-101$$

So, the equation is: $b=-100$

$$\boxed{y=-x^2-100x+1000}$$

Now, solve for when the fish population $=0$

$0=-x^2-100x+1000$ This eq. does not factor so use the quadratic formula.

$$x=\frac{100\pm\sqrt{(-100)^2-4(-1)(1000)}}{2(-1)}$$

$$x\approx-109.16 \text{ and } \underline{\underline{9.16}}$$

So about 9 yrs after 2002 or about 2011 there will be no more fish

⑤ Bank A: $A=500\left(1+\frac{.1}{4}\right)^{4t}$

$$A=500(1.025)^{4t}$$

Bank B: $A=500+\underset{\uparrow}{60}(t)$

$\$15\times4=60$

At year end	Bank A Balance	Bank B Balance
1	$551.91	$560
2	$609.20	$620
3	$672.44	$680
4	$742.25	$740

She should leave her money in for at least 4 yrs.