Mat 011 Agenda Day 22          June 22, 2006
Return Quiz
Worksheet on Graphing Quadratics
Review for Unit 4

Homework:  Topics 34 Review Test
Monday:  Test 4
Earl Black makes tea bags. The cost of making \( x \) million teas bags per month is \( C = x^2 - 38x + 400 \). The revenue from selling \( x \) million tea bags per month is \( R = 78x - x^2 \). Find the equation for Profit

\[
\text{Profit} = \text{Revenue} - \text{Cost}
\]

Revenue: \( R = 78x - x^2 \)

Cost: \( C = x^2 - 38x + 400 \)
Earl Black makes tea bags. The cost of making x million tea bags per month is \( C = x^2 - 38x + 400 \). The revenue from selling x million tea bags per month is \( R = 78x - x^2 \)

\[
P = \frac{(78x - x^2)}{2} \left( x^2 - 38x + 400 \right) = x^2 - 19x^2 - 76x + 400
\]

\[
P = -2x^2 + 116x - 400
\]

1. **Vertex**: \( x = -\frac{b}{2a} = \frac{-116}{-2} = 58 \)
   \[P = -2(58)^2 + 116(58) - 400 = 1282 \]

2. **x-intercepts**: \( P = 0 \)
   \[x = \frac{-116 \pm \sqrt{13456 - 4(-2)(-400)}}{2(-2)} = \frac{-116 \pm \sqrt{13456 - 3200}}{-4} = \frac{-116 \pm \sqrt{10256}}{-4} = \frac{-116 \pm 101.3}{-4} \]
   \[x = 2.7 \quad \text{or} \quad x = 54.3 \]

3. **x-intercept**: \( P = 0 \)
   \[x = \frac{-a + \sqrt{a^2 - 4bc}}{2a} = \frac{-116 + 101.3}{-4} = \frac{-116 + 101.3}{-4} = 3.7 \]
   \[x = \frac{-116 + 101.3}{-4} = 54.3 \]

4. **y-intercept**: \( P = 0 \)
   \[x = 0 \]
   \[P = -2(0)^2 + 116(0) - 400 = -400 \]

\( P \)
The equation for profit is,
\[ \text{Profit} = \text{Revenue} - \text{Cost} \]

Revenue: \[ R = 78x - x^2 \]

Cost: \[ C = x^2 - 38x + 400 \]

\[ P = (78x - x^2) - (x^2 - 38x + 400) \]
Graph the Profit Equation

\[ P = -2x^2 + 116x - 400 \]

**Vertex:**

\[ x = \frac{-b}{2a} \quad x = \frac{-116}{2(-2)} = \frac{-116}{-4} = 29 \]

\[ P = -2(29)^2 + 116(29) - 400 = 1282 \]

**Vertex:** (29, 1282)

\[ x = 29, \quad P = $1282 \]
(10, 25)

Max profit

Profit $25 50 75

-25 -50 -75

5 10 15 20 units

Lecture 31

Start up field Breakeven
Title: Jun 21-12:24 PM (7 of 42)
Worksheet

If the cost function for making coffee makers is
\( C = 0.2x^2 - 15x + 75 \) and
the revenue for selling them is:
\( R = -0.8x^2 + 5x \)

\( C \) and \( R \) are in hundreds of dollars.
Find the profit equation, and graph.

\[
P = -0.8x^2 + 5x - (0.2x^2 - 15x + 75)
\]
\[
P = -0.8x^2 + 5x - 0.2x^2 + 15x - 75
\]
\[
P = -1x^2 + 20x - 75
\]
\[ P = -x^2 + 20x - 75 \]

1. Opens down
2. Vertex \((10, 25)\)
3. X-intercepts \((5, 0)\), \((15, 0)\)
4. P-intercepts \((0, -75)\)

\[ \begin{array}{c|c}
   x & P \\
   \hline
   10 & 25 \\
   5 & 0 \\
   15 & 0 \\
   0 & -75 \\
\end{array} \]
The graph shows a parabolic function with a maximum area at a certain point. The equation for the area is given as:

\[ A = -3x^2 + 66x \]

A table is provided with the following data:

<table>
<thead>
<tr>
<th>( x )</th>
<th>( A )</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>363</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>22</td>
<td>0</td>
</tr>
</tbody>
</table>

The maximum area is marked on the graph, and the width is indicated as 22 ft.
Ms. Piggie wants to enclose two adjacent chicken coops of equal size against the hen house wall. She has 66 feet of chicken-wire fencing and would like to make the chicken coup as large as possible. Find the formula for the area of the chicken coops.

<table>
<thead>
<tr>
<th>W</th>
<th>L</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>46 - 3(5) = 31</td>
<td>255 sq ft</td>
</tr>
<tr>
<td>10</td>
<td>66 - 3(10) = 36</td>
<td>360 sq ft</td>
</tr>
<tr>
<td>15</td>
<td>66 - 3(15) = 21</td>
<td>315 sq ft</td>
</tr>
</tbody>
</table>

Let $x = 66 - 3x$.

\[
A = (66 - 3x) x
\]

\[
A = -3x^2 + 66x
\]
\[ A = -3x^2 + 66x \]

1. Opens down
2. Vertex: \( x = \frac{-b}{2a} = 11 \)
   \[ (11, 363) \]
   \[ A = -3(121) + 66(11) = -363 + 726 = 363 \]
3. \( x \)-intercepts
   \[ 0 = -3x(x-22) \]
   \[ (0,0) (22,0) \]

\[ x = -3 \]
\[ b = 66 \]
\[ c = 0 \]
Ms. Piggie wants to enclose two adjacent chicken coops of equal size against the hen house wall. She has 66 feet of chicken-wire fencing and would like to make the chicken coup as large as possible. Find the formula for the area of the chicken coops.

<table>
<thead>
<tr>
<th>Width</th>
<th>Length</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Ms. Piggie wants to enclose two adjacent chicken coops of equal size against the hen house wall. She has 66 feet of chicken-wire fencing and would like to make the chicken coup as large as possible. Find the formula for the area of the chicken coops.

<table>
<thead>
<tr>
<th>Width</th>
<th>Length</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>66-3(5)=56</td>
<td>5(51)=251</td>
</tr>
<tr>
<td>10</td>
<td>66-3(10)=36</td>
<td>10(36)=360</td>
</tr>
<tr>
<td>15</td>
<td>66-3(15)=21</td>
<td>15(21)=315</td>
</tr>
<tr>
<td>X</td>
<td>66-3(X)</td>
<td>X(66-3X)=</td>
</tr>
<tr>
<td></td>
<td></td>
<td>66X-3X²</td>
</tr>
</tbody>
</table>
Graph: \[ A = -3X^2 + 66X \]

Vertex:

\[ x = \frac{-b}{2a} \]
\[ x = \frac{-66}{2(-3)} = \frac{-66}{-6} = 11 \]

\[ A = -3(11)^2 + 66(11) = 363 \]

Vertex: (11, 363)

\[ x=11 \text{ feet, } A = 363 \text{ sq. feet} \]
Graph: \[ A = -3X^2 + 66X \]

**x-Intercepts:** when \( A = 0 \), what is \( x \)?
Graph: \( A = -3X^2 + 66X \)

**x-Intercepts:** when \( A = 0 \), what is \( x \)?

\[
A = -3X^2 + 66X
\]

\[
0 = -3X^2 + 66X
\]

\[
0 = -3X(X - 22)
\]

\[
0 = -3X \quad \text{or} \quad 0 = (X - 22)
\]

\[
0 = X \quad \text{or} \quad X = 22
\]
Graph: \[ A = -3X^2 + 66X \]

A-Intercept: when \( x = 0 \), what is \( A \)?

\[ A = -3X^2 + 66X \]
Graph: \[ A = -3X^2 + 66X \]

1. Because \( a = -3 \), parabola opens down
2. Vertex: (11, 363)
3. \( x \)-Intercepts: (0, 0) and (22, 0)
4. \( A \)-Intercept: (0, 0)
Graph: 

\[ A = -3X^2 + 66X \]

Area (sq. feet):

- (0, 360)
- (11, 363)
- (12, 360)
- (22, 0)

\[ A = 360 \]
Find the dimensions of the coop if the area can only be 360 sq feet.

When $A = 360$, what is $x$?

$$A = -3x^2 + 66x$$

$$360 = -3x^2 + 66x$$

Subtract 360 from both sides

$$0 = -3x^2 + 66x - 360$$

$$0 = -3(x^2 - 22x + 120)$$

$$0 = -3(x - 10)(x - 12)$$

$$0 = (x - 10) \quad \text{or} \quad 0 = (x - 12)$$
Find the dimensions of the coop if the area can only be 360 sq feet.

\[ A = -3x^2 + 66x \]

\[ 360 = -3x^2 + 66x \]

\[
\begin{align*}
-360 & \quad - \quad -360 \\
0 & = -3x^2 + 66x - 360 \\
0 & = -3(x^2 - 22x + 120) \\
0 & = -3(x-10)(x-12)
\end{align*}
\]

\[
\begin{align*}
x - 10 & = 0 \quad \text{or} \quad x - 12 = 0 \\
x & = 10 \quad \quad x = 12
\end{align*}
\]
Find the dimensions of the coop if the area can only be 360 sq feet.

When $A = 360$, what is $x$?

$$A = -3X^2 + 66X$$

$$360 = -3X^2 + 66X$$

$$0 = -3X^2 + 66X - 360$$

$$0 = -3(X^2 - 22X + 120)$$

$$0 = -3(X - 10)(X - 12)$$

$$0 = (X - 10) \quad \text{or} \quad 0 = (X - 12)$$

$$X = 10 \quad \text{or} \quad X = 12$$
Graph: \[ A = -3X^2 + 66X \]
Graph: \[ A = -3X^2 + 66X \]

- Area (sq. feet)
  - (0,0)
  - (10,360)
  - (11,363)
  - (12,360)
  - (22,0)

- Width (feet)
  - 3, 6, 9, 12, 15, 18, 21
Graph:

\[ A = -3X^2 + 66X \]

Area [sq. feet]

(0,0)  (10,360)  (11,363)  (12,360)  (22,0)

Width (feet)

3  6  9  12  15  18  21
Lighten Up Company makes light bulbs. The cost of making $x$ thousand light bulbs per week is $C = 0.5x^2 - 14x + 120$. The revenue from selling $x$ thousand light bulbs per week is $R = 12x - 0.5x^2$.

Find the equation for Profit

$$P = -0.5x^2 + 26x - 120$$
Silboat

\[ A = \frac{1}{2} b h \]
A farmer wants to enclose adjacent rectangular fields with 1000 feet of barbed wire fencing as indicated below. Find the equation for the area of the fields.
State the quadratic formula.
State the formula for the $x$ coordinate of the vertex.
Herb's Company need to make a profit of $30. Graph and find where the lines intersect.
Graph the Profit Equation

\[ P = -2x^2 + 28x - 50 \]

When \( P = 30 \), what is \( x \)?

\[ P = -2x^2 + 28x - 50 \]
Simplify:

\[5(2x^2 - x + 1) - 3(6x^2 - 7x + 2)\]
Multiply:

\[(2x-1)(x+5)\]
Multiply: $(x-3)^2$
Factor: $9x^2 + 6x$
Factor: $x^2 - 2x - 15$
Solve: \( x^2 + 5x + 6 = 0 \)