Mat 161 Agenda Day 19  10/14/05

Worksheet 25

Review Questions

**Homework:** Study for Test 2

**Quiz**
Solve for $x$ by completing the square: $9x^2 - 18x + 3 = 0$

\[
9x^2 - 18x = -3
\]

\[
9(x^2 - 2x + 1) = -3 + 9
\]

\[
\sqrt{9(x-1)^2} = \sqrt{6}
\]

\[
3(x-1) = \pm \sqrt{6}
\]

\[
x-1 = \frac{\pm \sqrt{6}}{3}
\]

\[
x = 1 + \frac{\pm \sqrt{6}}{3}
\]

\[
\frac{1 + \sqrt{6}}{3}, \quad \frac{1 - \sqrt{6}}{3}
\]

\[
\frac{3 + \sqrt{6}}{3}, \quad \frac{3 - \sqrt{6}}{3}
\]
Solve for $x$ by completing the square: $9x^2 - 18x + 3 = 0$

$9x^2 - 18x + 3 = 0$

$3x^2 - 6x + 1 = 0$

$x^2 - 2x + \frac{1}{3} = 0$

$\sqrt{(x-1)^2} = \pm\sqrt{\frac{2}{3}}$

$x-1 = \pm\sqrt{\frac{2}{3}} = \frac{\sqrt{2}}{\sqrt{3}} = \frac{\sqrt{6}}{3}$

$x = 1 \pm \frac{\sqrt{6}}{\sqrt{3}} = \frac{3 + \sqrt{6}}{3} \quad \frac{3 - \sqrt{6}}{3}$
\[ \frac{[2(-4)]^2}{2} = 4 \]

\[ 2x^2 - 8x + 5 = 0 \]

\[ 2x^2 - 8x = -5 \]

\[ 2(x^2 - 4x + 4) = -5 + 8 \]

\[ \sqrt{2(x-2)^2} = \sqrt{3} \]

\[ \sqrt{2} (x-2) = \pm \sqrt{3} \]

\[ x - 2 = \pm \frac{\sqrt{3}}{\sqrt{2}} \]

\[ x - 2 = \pm \frac{\sqrt{6}}{2} \]

\[ x = 2 \pm \frac{\sqrt{6}}{2} \]

\[ \approx 2 - \frac{\sqrt{6}}{2} \]

\[ = \frac{4 + \sqrt{6}}{2} \]

\[ \frac{4 - \sqrt{6}}{2} \]

exact
Find all solutions algebraically and graphically:
$5x^3 + 30x^2 + 45x = 0$

$5x(x^2 + 6x + 9) = 0$

$5x(x+3)(x+3) = 0$

$5x = 0 \quad x+3 = 0 \quad x+3 = 0$

$x = 0 \quad x = -3$

\[ \text{multiplicity 2} \]
Solve the inequality and graph on the numberline:

\[ x^2 - 6x + 9 < 16 \]

\[ \Rightarrow -1 < x < 7 \]

\[ x^2 - 6x - 7 < 0 \]

\[ (x-7)(x+1) < 0 \Rightarrow \text{negative sign} \]

The graph shows the solution to the inequality on the number line, with the interval \((-1, 7)\) shaded.
\[(1-x)(x+2) = 0\]

\[\begin{array}{c|c}
-\infty & + \\
-10 & + \\
-4 & + \\
1 & - \\
1 & - \\
\end{array}\]

\[1, -10\]
\[ 5x^2 - 2x + 6 = 0 \]

\[ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]

\[ = \frac{2 \pm \sqrt{4 - 4(5)(6)}}{2(5)} \]

\[ = \frac{2 \pm \sqrt{-116}}{10} \]

\[ = \frac{2 \pm 10\sqrt{29}i}{10} \]

\[ = \frac{1 \pm \sqrt{29}i}{5} \]
Example  Chart below gives the profit for a company for the years 1990 to 1999, where 0 corresponds to 1990 and the profit is in millions of dollars.

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profit</td>
<td>5.1</td>
<td>5.22</td>
<td>5.44</td>
<td>5.56</td>
<td>5.8</td>
<td>5.99</td>
<td>6.22</td>
<td>6.68</td>
<td>6.6</td>
<td>6.77</td>
</tr>
</tbody>
</table>

a) Sketch a scatter plot of the data.

LinReg
\[ y = ax + b \]
\[ a = 0.2003636364 \]
\[ b = 5.0363636364 \]
\[ r^2 = 0.9767177758 \]
\[ r = 0.9882903297 \]
Mat 161 Topics for Test 2

- Solve equations and check answers algebraically or graphically.
- Solve by the Quadratic Formula. Write answer in exact form and using a decimal approximation.
- Multiply and divide complex numbers
- Find all solutions, real and complex, algebraically. Verify using calculator.
  - degree 2 - quadratic
  - degree 4
  - with radicals
  - absolute values
  - cubic roots
- Inequalities
  - linear
  - absolute values
  - rational inequalities
- Regression Equation
  - scatter plot
  - predicting other values
- Application Problem
1. Solve each equation for \( x \).

a. \( 8x - 2 = 13 - 2x \)

b. \( \frac{7x}{x-2} + \frac{2x}{x+2} = 9 \)
2. Perform the indicated operations.

a. \((3 + 7i)(6 - 2i)\)

b. \(\frac{3 - 4i}{5 + 2i}\)

c. \(3 - \sqrt{-4} i + (\sqrt{-9})i\)
3. Solve by factoring

a. \(4x^2 + 12x + 9 = 0\)
4. Solve by extracting roots.

\[ 7(x+2)^2 = 12 \]
5. Solve by completing the square.

a. \( x^2 - 8x + 2 = 0 \)

b. \( 2x^2 - 8x + 5 = 0 \)
6. Use the quadratic formula

\[5x^2 - 2x + 6 = 0\]
7. Solve for $x$

a. $3x - 2\sqrt{x} - 5 = 0$
b. \[ \sqrt{15x + 4} = 4 - \sqrt{2x + 3} \]
c. \[ \frac{4}{x} - \frac{3}{x+1} = 7 \]
d. \[ |2 - 4x| = 12 \]
\[ |3x - 1| > 2 \]
\[ f. \quad |x + 5| \leq 2 \]
g. \[ 2x^2 + 3x < 9 \]
h. \[ \frac{4}{x + 1} \leq \frac{3}{x + 2} \]
Solve $\sqrt{15x + 4} = 4 - \sqrt{2x + 3}$ graphically.

a. Writing as two separate functions

b. Writing as one single function
9. a. Graph the following set of data using your calculator to find a linear model.
b. Interpret the slope of the model in the context of the problem.
c. Estimate sales for advertising expenditure of $1500.

<table>
<thead>
<tr>
<th>Month</th>
<th>Advertising Expenditures, x</th>
<th>Sales volume, y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.4</td>
<td>202</td>
</tr>
<tr>
<td>2</td>
<td>1.6</td>
<td>184</td>
</tr>
<tr>
<td>3</td>
<td>2.0</td>
<td>220</td>
</tr>
<tr>
<td>4</td>
<td>2.6</td>
<td>240</td>
</tr>
<tr>
<td>5</td>
<td>1.4</td>
<td>180</td>
</tr>
<tr>
<td>6</td>
<td>1.6</td>
<td>164</td>
</tr>
<tr>
<td>7</td>
<td>2.0</td>
<td>186</td>
</tr>
</tbody>
</table>
Example: (From page 208.)

131. The distance $d$ (in miles) a car can travel on one tank of fuel is approximated by $d = -0.024s^2 + 1.455s + 431.5, \ 0 < s \leq 75$, where $s$ is the average speed of the car in miles per hour.
b. Use the graph to determine the greatest distance that can be traveled on a tank of fuel. How long will the trip take?