Mat 161 Agenda Day 1  1/18/06

Index Cards:
  Name
  Address
  Phone Number
  Email Address
  Why taking this course
  Something Unique about you
Attendance Roll Sheet
Class Policy Sheet
Code of Ethics
Assignments and Course Outline

**Homework:**  Sections 1.1 and P1 pages 82 and 9

Web Page:  http://faculty.mc3.edu/rhofman/First.htm
Mat 161 Web page:

http://college.hmco.com/mathematics/larson/precalculus_aga/4e/students/index.html
Your username is: << first letter first name – full last name – last 4 digits of Datatel ID >>
Password is: <<Datatel ID>>
For Example:
Student Name: John Smith Datatel ID: 1234567
ID: jsmith4567
Password: 1234567
Login to my.mc3.edu

Use your network id & network password to login.

<table>
<thead>
<tr>
<th>Login Examples</th>
<th>ID</th>
<th>Password</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td>jsmith4567</td>
<td>0123456</td>
</tr>
<tr>
<td>Faculty/Staff</td>
<td>jsmith</td>
<td>abcdf</td>
</tr>
</tbody>
</table>

Please log in

Username: 
Password: 

Login to my.mc3.edu to read and send email, access course materials, and use other online services.

Need Help? Contact the Helpdesk:

<table>
<thead>
<tr>
<th>Email:</th>
<th><a href="mailto:helpdesk@mc3.edu">helpdesk@mc3.edu</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Phone:</td>
<td>215-641-6495</td>
</tr>
<tr>
<td>Hours:</td>
<td>M - F 8:00 a.m. - 11:00 p.m.</td>
</tr>
<tr>
<td></td>
<td>Sa 9:00 a.m. - 12:00 noon</td>
</tr>
</tbody>
</table>
BlackBoard: http://courses.mc3.edu

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Mathematics

Section 1.1
Graph of an equation
    By plotting points
    By graphing utility
Applications

Preliminary 1
Real Numbers
Inequalities
Absolute Value
Algebraic Expressions
Properties of Algebra

Homework: Sections 1.1 and P1 pages 82 and 9
The relationship between two quantities is often expressed by an equation.

\[3x + 9 = y\]
Definitions:
For an equation in the variables $x$ and $y$, a point $(a, b)$ is a **solution point** if the substitution of $x = a$ and $y = b$ satisfies the equation.

The set of all solution points of an equation is the **graph of the equation**.
Example: \[ y = -2x + 3 \]

Point-plotting

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>(x, y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3/2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>-1</td>
<td></td>
</tr>
</tbody>
</table>

\[
\begin{array}{|c|c|c|}
\hline
x & Y_1 & \text{Equation} \\
\hline
-1 & \text{?} & \text{?} \\
-0.5 & \text{?} & \text{?} \\
0.5 & \text{?} & \text{?} \\
1.5 & \text{?} & \text{?} \\
2 & 1 & \text{?} \\
\hline
\end{array}
\]

\[ Y_1 = -2x + 3 \]

\[ x = 1.5 \]

\[ y = 0 \]
See: $Y = \frac{-2x + 3}{x}$

See: GRAPH

See: TBLSET
and TABLE
Example: \( y = -x^2 - 4x \)

Graph using point-plotting and your calculator.

\[
\begin{align*}
  f(x) &= -x^2 - 4x \\
  f(1) &= -(1)^2 - 4(1) = -1 - 4 = -5
\end{align*}
\]
Graph a Circle: \[ x^2 + y^2 = 4 \]

\[ y^2 = 4 - x^2 \]

\[ y = \pm \sqrt{4 - x^2} \]
Solve for $y$: $y = \pm \sqrt{4 - x^2}$
Enter either way:
Look at Zoom Standard, Zoom Square and Zoom Decimal.
Example: (P. 85 #72)

The resistance \( y \) (in ohms) of 1000 feet of solid copper wire at 68 degrees Fahrenheit can be approximated by the mathematical model 

\[ y = \frac{10.770}{x^2} - 0.37 \quad 5 \leq x \leq 100 \]

where \( x \) is the diameter of the wire in mils (0.001 inch).

a. Complete the table:

<table>
<thead>
<tr>
<th>( x )</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[
y = \frac{10.770}{100} - 0.37
\]

\[
107.70 - 0.37 = 107.33
\]
a. Complete the table:

<table>
<thead>
<tr>
<th>x</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
b. Use your table to approximate the value of $x$ when the resistance is 4.8 ohms. Then determine the answer algebraically.

c. Use the \textit{value} feature or the \textit{zoom} and \textit{trace} features of a graphing utility to determine the resistance when $x = 85.5$.

d. What can you conclude in general about the relationship between the diameter of the copper wire and the resistance?
Real numbers
  Irrational numbers
  Integers
    Negative integers
    Whole numbers
      Natural numbers
      Zero
  Rational numbers
    Noninteger fractions (positive and negative)

\[ \overline{33333} = \frac{1}{3} \]
Rational Number

Either can be written as \( \frac{p}{q}, q \neq 0 \), where p and q are integers

Or has a repeating or terminating decimal expansion
Irrational Number has a nonterminating, nonrepeating decimal expansion
Use a calculator to order the numbers from smallest to largest: \( \frac{26}{15}, \sqrt{3}, 1.732, \frac{381}{220}, \frac{2103}{1214} \)
### Bounded Intervals on the Real Number Line

<table>
<thead>
<tr>
<th>Notation</th>
<th>Interval Type</th>
<th>Inequality</th>
<th>Graph</th>
</tr>
</thead>
<tbody>
<tr>
<td>([a, b])</td>
<td>Closed</td>
<td>(a \leq x \leq b)</td>
<td>![Closed Interval Graph]</td>
</tr>
<tr>
<td>((a, b))</td>
<td>Open</td>
<td>(a &lt; x &lt; b)</td>
<td>![Open Interval Graph]</td>
</tr>
<tr>
<td>([a, b))</td>
<td></td>
<td>(a \leq x &lt; b)</td>
<td>![Closed Interval Graph]</td>
</tr>
<tr>
<td>((a, b])</td>
<td></td>
<td>(a &lt; x \leq b)</td>
<td>![Open Interval Graph]</td>
</tr>
</tbody>
</table>
\((-3, 5)\) 

\([-3 < x < 5]\) 

\([-4, 2]\) 

\([-4 \leq x < 2]\)
\[ x < 2 \]
\[ (-\infty, 2) \]
\[ x \geq 3 \]
\[ [3, \infty) \]
### Unbounded Intervals on the Real Number Line

<table>
<thead>
<tr>
<th>Notation</th>
<th>Interval Type</th>
<th>Inequality</th>
<th>Graph</th>
</tr>
</thead>
<tbody>
<tr>
<td>([a, \infty))</td>
<td></td>
<td>(x \geq a)</td>
<td>![Graph of (<a href="image">a, \infty))</a></td>
</tr>
<tr>
<td>((a, \infty))</td>
<td>Open</td>
<td>(x &gt; a)</td>
<td><img src="image" alt="Graph of ((a, \infty))" /></td>
</tr>
<tr>
<td>((-\infty, b])</td>
<td></td>
<td>(x \leq b)</td>
<td>![Graph of ((-\infty, b])](image)</td>
</tr>
<tr>
<td>((-\infty, b))</td>
<td>Open</td>
<td>(x &lt; b)</td>
<td><img src="image" alt="Graph of ((-\infty, b))" /></td>
</tr>
<tr>
<td>((-\infty, \infty))</td>
<td>Entire real line</td>
<td>(-\infty &lt; x &lt; \infty)</td>
<td><img src="image" alt="Graph of ((-\infty, \infty))" /></td>
</tr>
</tbody>
</table>
Use interval notation to describe the subset represented by the inequality, then sketch on the real number line.

1. \( x \geq -2 \)
2. \( x < 2 \)
3. \( 0 \leq x \leq 5 \)
Use inequality and interval notation to describe the set:

4. $z$ is at least 10

5. Yield $y$ is no more than 45 bushels per acre

$$z \geq 10$$

$y \leq 45$
Definition of Absolute Value
If $a$ is a real number, then

$$|a| = \begin{cases} 
   a, & \text{if } a \geq 0 \\
   -a, & \text{if } a < 0
\end{cases}$$

$$-(−5) = +5$$

$$|-5| = 5$$

$$|5| = 5$$

$y = x$
Properties of Absolute Value

1. $|a| \geq 0$
2. $-a = |a|$
3. $|ab| = |a||b|$
4. $\frac{|a|}{|b|}, b \neq 0$
Examples: Place the correct symbol between the two quantities:

6. \(-4 \equiv 4\)

7. \(-6 \leq -6\)

\(-6 < 6\)

\(-6(x - 4) = -6x + 24\)
Distance Between Two Points on the Real Line

Let \( a \) and \( b \) be real numbers. The distance between \( a \) and \( b \) is

\[
d(a,b) = |b - a| = |a - b|.
\]
Example:
8. With and without a calculator, find the distance between $a$ and $b$ if $a = -126$ and $b = -75$. 

Definition of Algebraic Expression

An algebraic expression is a combination of letters (variables) and real numbers (constants) combined using the operations of addition, subtraction, multiplication, division, and exponentiation.

Language used in algebra
Term
Variable term  -5x, x^3,...
Constant term  -7, +8
Coefficient

Evaluate a term: substitute a given number for the variable or variables.

\[ 7x^3 + 2x^2 - 3x + 5 = 7x^3 + 2x^2 + (-3x) + 5 \]
Basic Rules of Algebra

Properties of Negation and Equality

Properties of Zero

Properties and Operations of Fractions

are on pages 7, 8 in the textbook
For an animation of inequality statements, go to the following site:

http://faculty.mc3.edu/rhofman/flash03/nov5/menuinequal.html
For an animation of inequalities, numberlines and intervals, go to the following site:

http://faculty.mc3.edu/rhofman/Flash03/Dec3/menunumber.html

**Inequalities, Numberlines & Intervals**

- Less than 3: $x < 3$
- Less than or equal to 3: $x \leq 3$
- Greater than 3: $x > 3$
- Greater than or equal to 3: $x \geq 3$
- Between -2 and 3 including 3: $-2 < x \leq 3$
For a review of fractions, go to the following site:

http://faculty.mc3.edu/rhofman/flash03/Finalprojectflash/menu.html
For a review of variables, go to the following site:

http://faculty.mc3.edu/rhofman/flash03/oct8/menuxtimesx.html