CENTRAL CONNECTICUT STATE UNIVERSITY
MATHEMATICS DEPARTMENT

READ THIS SYLLABUS CAREFULLY. YOU ARE RESPONSIBLE FOR KNOWING THIS INFORMATION.

Syllabus for: Applied Business Mathematics (Math.123); 3 credits.
Prerequisite: Math.101, with a grade of C-as a minimum or Placement Exam.

Instructor: Sylvia Schindelman
E-mail: zully34@sbcglobal.net

TEXT: Business Mathematics (Custom CCSU edition).
Bill Armstrong and Don Davis
CALCULATOR: TI 83 or 83+ is necessary. in class curriculum.
COURSE DESCRIPTION:
This course is for students majoring in Business.
COURSE OVERVIEW:
At the end of the course the student will be familiar with and be able to manipulate and use the following:

1) Linear functions, their graphs and applications.
2) Quadratic functions, their graphs and applications.
3) Intersections of functions/application of intersections.
4) Systems of equations.
5) Limits of functions.
6) Derivatives – including rules of derivatives of several kinds of functions.
7) Applications of derivatives.
8) Linear programming.

ATTENDANCE:
Students are expected to be in attendance at all classes. Success in any mathematics course depends on mastering the concepts in a sequential manner. Missing classes puts the student at a disadvantage in mastering these concepts. It is especially detrimental for the student to miss more than one class in sequence.
COURSE CONTENT:
The tentative schedule list is attached in this syllabus.

ASSIGNMENTS:
Assigned exercises for homework completion are also attached herein. A student is expected to spend between 6 and 9 hours working outside of class each week.

RESOURCES AVAILABLE:

1) Office hours – T/Th (10:45 - 11:15) DL 308
2) The Learning Center at hours during each day – they will be posted after the start of the semester.
3) Form a STUDY GROUP with other students in this section. Explaining the process of homework problems to each other is a good way to learn.
4) A list of private tutors for hire is available in the math. Department office, Room 107, Marcus White, 832-2835.

TESTS:

There will be 4 tests, each scheduled at the end of a chapter. If you are absent on the day a test is scheduled a make up test will be permitted ONLY if I am notified IN ADVANCE (via e-mail) of your inability to be present.

FINAL EXAM:

A comprehensive test covering all material listed in the schedule.
ACADEMIC HONESTY is expected at all times.

GRADE:

Final grade will be the average of CLASS TESTS AND THE FINAL EXAM.

Special Needs

. Please contact me privately to discuss your specific needs if you believe you need course accommodations based on the impact of a disability, medical condition, or if you have emergency medical information to share. I will need a copy of the accommodation letter from Student Disability Services in order to arrange your class accommodations. Contact Student Disability Services, room 241, Copernicus Hall if you are not already registered with them. Student Disability Services maintains the confidential documentation of your disability and assists you in coordinating reasonable accommodations with your faculty.

COURSE OUTLINE - MATH 123 "Applied Business Mathematics"

NOTE: The topics below are referenced by section numbers to the textbook by Armstrong and Davis.

We will use a custom published version of the text including these chapters and an appendix on Excel.

Chapter 1. Linear Equations and Functions

[**All of this chapter should be review material.** There are many "word problems" to go with each section, and they could be used as a starting point to bring out the mathematics as it's needed. In any case, this chapter should be covered as quickly as possible.]

1.1 Solution of linear equations in one variable. NOTE: Emphasis on word problems.
1.2 Linear functions
1.3 Linear models (using linear expressions to set up word problems); the use of graphing calculators is also demonstrated in this section.
1.4 Solving 2x2 systems of linear equations graphically (and with calculators).
1.5 Solving 2x2 systems of linear equations algebraically. [Hold 3x3 systems until later.]

Chapter 1: 1½ to 2 weeks.

Chapter 11. Other functions. [**Some of this chapter should also be review material.**]

11.1 Graphing functions
11.2 Introduction to problem solving [a key section]
11.3 Linear functions: Largely an overlap with section 1.2, except perhaps for the absolute value function, and a discussion of rates of change.
11.4 Quadratic functions; average rates of change.
11.5 Polynomial functions; "business" functions.
11.9 Modeling: Fitting curves to data using calculators.

Chapter 11: 2 to 2 ½ weeks.

Chapters 12 & 13. Derivatives

12.1 Limits and continuous functions. [The intent is to do this quickly, perhaps in one day, using various functions (including piece-wise functions) for demonstration purposes.]
12.3-12.4 Derivatives. [Approached as rates of change, then also (graphically) as slopes of tangent lines.]
12.5 Derivative formulas: for polynomials, plus the power rule for negative exponents.

13.2 Applications. [Two primary ones are minimizing average cost and maximizing profit (revenue minus cost). Comparison of computational results with graphical procedures should be done.]

Chapters 12 & 13: 3½ to 4 weeks

Chapter 3: Inequalities and Linear Programming

3.1 Inequalities in one and two variables.

3.2-3.3 Graphical approach to linear programming. [This procedure is useful only for problems having two variables, but it is a good demonstration of the math tools needed for more complex problems.]

3.4.1 Applications (using computer software). [Teaching the simplex algorithm to students at this level is probably not very beneficial. No one in the 'real world' implements it by hand. Much more useful, and time-consuming, is getting students to learn how to analyze a problem and set it up in mathematical terms, and then letting them interpret computer output in terms of what it all means.]

NOTE: A package in Excel that does Linear Programming will be used.

Chapter 3: 3½ to 4 weeks

Chapter 2: Matrices

[Return first to section 1.5 to cover 3x3 systems of linear equations.]

2.1 What matrices are; Gauss-Jordan elimination procedure, 3x3 systems.

Chapter 2: 1½ to 2 weeks

Sections 11.7 & 11.8. Exponential and log functions. [These sections labeled optional, and should be covered only as time allows.]

Mrs. S. Schindelman

SUMMARY OF GRADING

Activity	Total points
Chapter tests 4 @ 100 points=	400
Final examination	100
Homework (minus 2 points for each missed assignment)	
TOTAL	500 POINTS

Grading	Points	Percent
A	500-480	100%-96%
A-	479- 450	95%-90%
B+	449- 430	89%-86%
B	429- 415	85%-83%
B-	414- 400	82%-80%
C+	399- 380	79%-76%
C	379- 365	75%- 73%
C-	364- 350	72%- 70%
D+	349-330	69% - 66%
D	329- 315	65%- 63%
D-	314-300	62%-60%
F	299-0	< 60%

BASIC FORMULEA:

Exponential:

Let a,b be a real number and n, m a positive integer:

1. $b^0 = 1$
2. $b^m . b^n = b^{m+n}$
3. $\frac{b^m}{b^n} = b^{m-n}, b \neq 0$
4. $(b^m)^n = b^{m \cdot n}$
5. $(ab)^n = a^n b^n$
6. $b^{-n} = \frac{1}{b^n}$
7. $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}, b \neq 0$
8. $b^{m/n} = \sqrt[n]{b^m} = \left(\sqrt[n]{b}\right)^m$

Logarithmic:

Log of x to be base b is defined as:

$$y = \log_b x, iff .. b^y = x, b \neq 1, b > 0, x > 0$$

Properties:

1. $\log_b 1 = 0$
2. $\log_b b = 1$
3. $\log_b (m.n) = \log_b m + \log_b n$
4. $\log_b \left(\frac{m}{n}\right) = \log_b m - \log_b n$
5. $\log_b m^n = n \log_b m$
6. $\log_b b^r = r$
7. $\log_b m = \log_b n, iff ... m = n$

Function:

Is a set of ordered pairs (x,y) that assigns a unique y-value to each x-value

Let (x,y) and (x,y_1) be ordered pairs. It will be a function iff $y = y_1$

The set of x-values is **Domain** and the set of all possible y-values is **Range**.

Vertical Line Test:

If every vertical line drawn through a graph intersects the graph at one point. Then the graph represents a function.

Intervals:

Finite Intervals: Closed [a,b] Open (a,b)

Half Closed [a,b) , (a,b]

Note: if the graph of two equations in two variables intersect at a point. The **Point of intersection** is a solution.

Cost of Producing x units of product:

Cost = (cost per unit) * x + fixed cost is of the form C(x) = mx + b

Where fixed cost is y-intercept, slope is cost per unit

Revenue from selling x products: R(x) = x * p

x = quantity sold, p = price per unit

Solving System of Linear Equations Algebraically:

1. Substitution Method
2. Elimination Method

Marginal Cost: cost of producing (x + 1)th item of product

Piecewise function: of the form $f(x) = \begin{cases} x+2, x<1 \\ 3-x, x \geq 1 \end{cases}$

Absolute Value function: $f(x) = |x| = \begin{cases} -x, x<0 \\ x, x \geq 0 \end{cases}$

Quadratic function: is of the form $f(x) = ax^2 + bx + c$ where a,b,c are real Numbers and $a \neq 0$

Note: Shape of a quadratic function is a **parabola**

1. if a > 0, parabola opens upward
2. if a < 0, parabola opens downward
3. Vertex of a parabola is $x = \frac{-b}{2a}$
4. Vertex of a parabola is a **maximum value** if a < 0 (opens downward)
5. Vertex of a parabola is a minimum value of a > 0 (opens Upward)

Roots of the Quadratic function: $f(x) = y = ax^2 + bx + c$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ where $b^2 - 4ac$ is called **discriminant**

1. $b^2 - 4ac > 0$, the graph has two real roots
2. $b^2 - 4ac = 0$, the graph has one real root
3. $b^2 - 4ac < 0$, the graph has no real roots

Infinite Intervals: $[a,\infty)$, (a,∞), $(-\infty,a)$, $(-\infty,a]$, $(-\infty,\infty)$

Linear Function: $y = f(x) = mx + b$ where m is the slope or average rate of change of the line and b being constant number.

Increasing/Decreasing function:

Function (Line) is increasing if $m > 0$

as x-values increase => y-values increases

decreasing if $m < 0$

as x-values increase => y-values decreases

horizontal if $m = 0$

as x-values increase => y-values remains same (constant)

vertical if m is undefined.

Makes a vertical line

Slope:

Let (x_1,y_1) and (x_2,y_2) be ordered pairs representing two points on a line, then the slope of the line $m = \frac{y_2 - y_1}{x_2 - x_1}$

Intercepts:

y-intercept is a point on the y-axis (where $x = 0$)

x-intercept is a point on the x-axis (where $y = 0$)

Linear Cost function:

$C(x)$ = (cost per unit) * x + fixed costs

Standard Equation of a Line:

$ax + by = c$ where a,b,c are real numbers, $a \geq 0$, a and b are not both zero

Point-Slope Form: line passing through a point y_1

$y - y_1 = m(x - x_1)$

Slope Intercept Form: $y = mx + b$ (slope m, y-intercept (0,b))

Linear Model: is a type of linear function that is derived from real world data.

System of Linear Equations: is a collection of two or more linear equations with each having at least one variable. A **solution** to a system of linear is the values that make each equation true.

Parallel lines: Lines are parallel if their slopes are equal

Perpendicular Lines: Two lines with slopes m_1, m_2 are perpendicular if

$m_1 = -\frac{1}{m_2}$

Arithmetic Operations:

$ab+ac = a(b+c)$

$\frac{a}{b} + \frac{c}{d} = \frac{ad+bc}{bd}$

$\frac{a+b}{c} = \frac{a}{c} + \frac{b}{c}$

$\frac{\left(\frac{a}{b}\right)}{\left(\frac{c}{d}\right)} = \frac{ad}{bc}$

$a\left(\frac{b}{c}\right) = \frac{ab}{c}$

$\frac{a-b}{c-d} = \frac{b-a}{d-c}$

$\frac{ab+ac}{a} = b+c,\ a \neq 0$

$\frac{\left(\frac{a}{b}\right)}{c} = \frac{a}{bc}$

$\frac{a}{\left(\frac{b}{c}\right)} = \frac{ac}{b}$

Exponents and Radicals:

$a^0 = 1,\ a \neq 0$

$\frac{a^x}{a^y} = a^{x-y}$

$\left(\frac{a}{b}\right)^x = \frac{a^x}{b^x}$

$\sqrt[n]{a^m} = a^{m/n} = (\sqrt[n]{a})^m$

$a^{-x} = \frac{1}{a^x}$

$(a^x)^y = a^{xy}$

$\sqrt{a} = a^{1/2}$

$\sqrt[n]{ab} = \sqrt[n]{a}\sqrt[n]{b}$

$a^x a^y = a^{x+y}$

$(ab)^x = a^x b^x$

$\sqrt[n]{a} = a^{1/n}$

$\sqrt[n]{\left(\frac{a}{b}\right)} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$

Algebraic Errors to Avoid:

$\frac{a}{x+b} \neq \frac{a}{x} + \frac{a}{b}$ (To see this error, let $a = b = x = 1$.)

$\sqrt{x^2+a^2} \neq x + a$ (To see this error, let $x = 3$ and $a = 4$.)

$a-b(x-1) \neq a-bx-b$ (Remember to distribute negative signs. The equation should be $a - b(x - 1) = a - bx+b$.)

$\frac{\left(\frac{x}{a}\right)}{b} \neq \frac{bx}{a}$ (To divide fractions, invert and multiply. The equation should be $\frac{\frac{x}{a}}{b} = \frac{\frac{x}{a}}{\frac{b}{1}} = \left(\frac{x}{a}\right)\left(\frac{1}{b}\right) = \frac{x}{ab}$.)

$\sqrt{-x^2+a^2} \neq -\sqrt{x^2-a^2}$ (We can't factor a negative sign outside of the square root.)

$\frac{a+bx}{a} \neq 1+bx$ (This is one of many examples of incorrect cancellation. The equation should be $\frac{a+bx}{a} = \frac{a}{a} + \frac{bx}{a} = 1 + \frac{bx}{a}$.)

$\frac{1}{x^{1/2}-x^{1/3}} \neq x^{-1/2}-x^{-1/3}$ (This error is a sophisticated version of the first error.)

$(x^2)^3 \neq x^5$ (The equation should be $(x^2)^3 = x^2x^2x^2 = x^6$.)

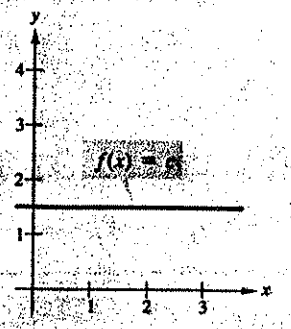
Conversion Table:

1 centimeter = 0.394 inches
1 meter = 39.370 inches
= 3.281 feet
1 kilometer = 0.621 miles
1 liter = 0.264 gallons
1 newton = 0.225 pounds

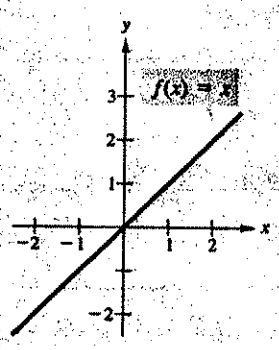
1 joule = 0.738 foot-pounds
1 gram = 0.035 ounces
1 kilogram = 2.205 pounds
1 inch = 2.540 centimeters
1 foot = 30.480 centimeters
= 0.305 meters

1 mile = 1.609 kilometers
1 gallon = 3.785 liters
1 pound = 4.448 newtons
1 foot-lb = 1.356 joules
1 ounce = 28.350 grams
1 pound = 0.454 kilograms

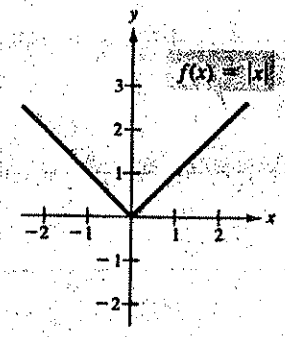
GRAPHS OF COMMON FUNCTIONS



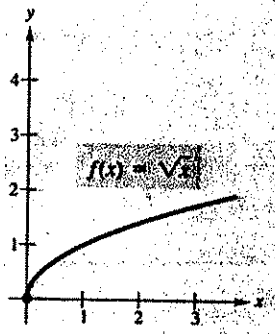
Constant Function



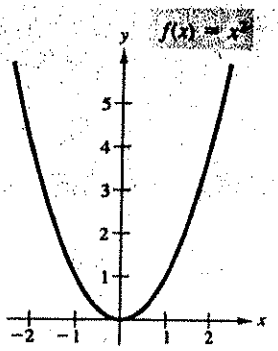
Identity Function



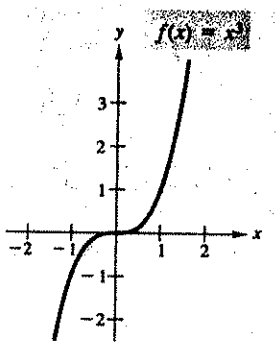
Absolute Value Function



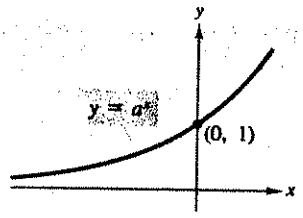
Square Root Function



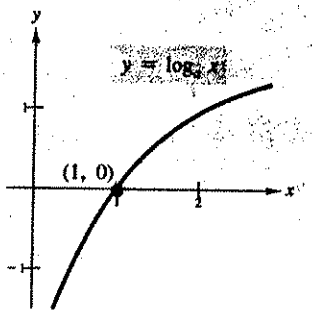
Squaring Function



Cubing Function

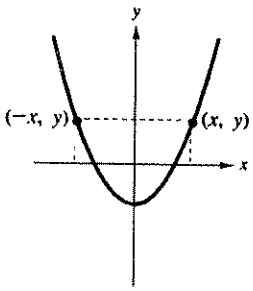


Exponential Function

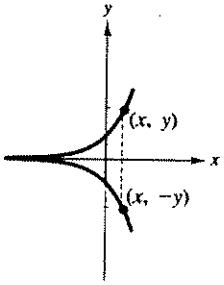


Logarithmic Function

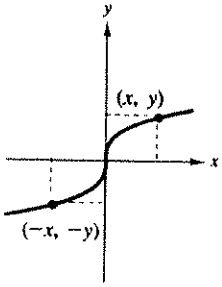
SYMMETRY



***y*-Axis Symmetry**



***x*-Axis Symmetry**



Origin Symmetry

Math 123 Fall '10
05
RN 13751

Date	Chapter/Section	Homework Assignment
8/31	Course Prep / 6.1	1-31 odd only
9/2	1.2	13-57 odds & 67
9/7	1.3	1-21 odds, 27, 31-39 odds
9/9	1.3/1.4	43, 51 / 9-19 odds, 23, 33-38 all
9/14	1.4/1.5	39-43 odds, 59, 60 / 7-39 [every 4th ex: 1, 5, 9...]
9/16	Test Ch 1 / 11.1	11, 15, 18-24 all
9/21	11.1, 11.2	25, 33, 37, 43, 45, 47 / 1-9 odds
9/23	11.2	13, 17, 21, 29
9/28	11.3	1, 5, 8, 10, 13-27 odds, 35, 37, 41, 43, 55-61 odds
9/30	11.4	1-31 [every 4th ex: 1, 5, 9...] & 33, 35, 42, 45
10/5	11.5	1-11 odds, 13, 15, 21-41 odds, 51-55 odds, 61, 65
10/7	Ch. 11 test / 12.1	11-39 odds
10/12	12.1, 12.2	41-63 odds / 1-9 odds
10/14	12.2	11-27 odds
10/19	12.3	1-19 odds
10/21	12.3	29-43 odds
10/26	12.5	1-33 odds
10/28	12.5	35-63 odds
11/2	Ch. 12 test / 13.2	1, 3, 5
11/4	13.2	11, 13, 17-21 odds, 25, 27
11/9	13.2	(as needed)
11/11	Ch. 13 test / 3.1	5, 13, 17
11/16	3.1	23, 25, 33, 35, 38
11/18	3.2	1-4, 5, 9, 15, 19, 23, 25, 27, 29, 33, 35
11/23	3.3	1, 3, 5, 7
11/30	3.3 / 3.4	9-21 odds / 1, 2
12/2	3.4	as needed
12/7	Use for "catch up"	★ FINAL EXAM 12/14 at 8am-10am.