GRAPHING EQUATIONS

INTEGRATED ALGEBRA (9TH –11TH)

FIVE-DAY UNIT PLAN

Ti-83+ Calculator, Warm-up #1, Cognitive Tutor, Internet Options

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**Objectives and Standards**

**Objective:** To introduce students to graphing equations via Ti-83+ graphing calculator. The students will see the different functions and how they change after being manipulated. This will help my students become more comfortable and used to using technology in the classroom as well as at home. The students will see results first hand empirically and visually. The students will be able to predict the outcome of graphing in future assignments.

**NCTM Standards:** Under Number and Operations the students will judge the effects of such operations as multiplication, division, and computing powers such as roots on the magnitudes of quantities. By using Algebra Standards the students will generalize patterns using explicitly defined recursively defined functions. Under Measurement Standards students will apply informal concepts of successive approximations, upper and lower bounds, and limits in measurement situations. Using Problem Solving, students will apply and adapt a variety of appropriate strategies to solve problems. Under the Communication Standard students will use the language of mathematics to express mathematical ideas.

**NYS Standards:** Mathematical analysis will be used when demonstrating knowledge of mathematical relationships. Number and numeration will be implemented when communicating and reasoning mathematically. Students will be able to identify patterns and functions to apply to the topic of real-life situations. The students will also be able to mathematically model with multiple representations.
Resources/Materials/Equipment

- Ti-83+ Graphing Calculators.
- Ti-83+ Graphing Calculator Overhead Unit.
- Student Choices of Internet Resources (e.g. askjeeves, drmath, etc.)
Overview

The students will work through five days of using the Ti-83+ graphing calculator. The instructor will work with the students using the Ti-83+ overhead-graphing calculator provided by I2T2. Students will become very familiar with the Ti-83+ calculator and in the future will not need step-by-step modeling for similar problems. The students will follow exactly what the instructor is modeling for them to complete the task on their own. The instructor will monitor their progress at all times. The students will then annotate in their notes exactly what calculator key sequences they used to perform the operations. Using one of these three methods will help the students remember how to solve these problems in the future.

**Day 1:** The students will use the graphing function on the Ti-83+ to solve quadratic equations. The instructor will have the directions as how to enter the information and solve on a separate handout. The students will be given four examples to solve on their own and with a partner to check for accuracy. The instructor will monitor for understanding by walking around and asking questions for understanding. The students will be asked to write out in their notes the key sequences involved to perform the operation. The students will choose 5 out of 10 problems from the Cognitive Tutor textbook we use in class. These problems will be due the next class day for presentation.

**Day 2:** Students will learn solving quadratic equations by graphing on their Ti-83+ calculators. The instructor will guide the students through the calculator sequence by modeling on the overhead unit. The students will follow the instructor on their calculator step-by-step. The students will then have four problems to do on their own. The instructor will check for understanding by raise of hand and walking around. For homework the students will find the solution to four separate equations and sketch what they see.
**Day 3**: The students will graph exponential functions using the Ti-83+ calculator provided. The instructor will give notes on the board with a set of instructions that explain how to graphically represent the exponential function while writing down the steps involved. The students will copy the notes into their notebooks. The students will practice graphing each exponential function and sketch what they see on the display. Also, they will write in their notes each step in the calculator sequence. Homework will be an additional four problems using the same set of steps involved as used in class.

**Day 4**: The students will learn to graph rational functions using the Ti-83 calculator. The students will use knowledge from previous lessons to try to master the solutions via graphing. The instructor will demonstrate how to perform the task at hand. The students will be provided with four additional examples to work on with a partner in class. Again, the students must write down the calculator sequences needed to perform the task. The Instructor will monitor progress by meeting with each group for a few minutes to ensure fairness to all. Homework for students will be to make-up their own example to solve, write down keystrokes, and present to class next day.

**Day 5**: The students will be able to graph radical functions using the Ti-83+ calculator provided. The instructor will demonstrate the graphing of radical functions on the Ti-83+ overhead unit. The students will complete the four examples provided and again, will write down the calculator sequences involved. The instructor will walk around to check for understanding. The students will be asked to graph two additional radical functions using the Internet for a resource in the computer lab for the second half of class. The students will select the two problems for homework and be ready to explain their findings to the class using the overhead calculator unit. Students are expected to give URL and author.
Lesson Plans

Day 1:

Objective: The students will be solving quadratic equations using the Ti-83+ graphing calculator. The students will become comfortable using the calculator and be able to extend the knowledge to others. The students will be able to solve quadratic equations with great levels of accuracy.

Outline of the activity with instructions for the teacher:
1. Hook up all the technology equipment for the overhead.
2. Pass out graphing calculators to students.
3. Use page 26 of the Easy Warm Ups Algebra One sheet as a guide for students.
4. Verbally give directions.
5. Show and model on the overhead.
6. Write the steps out.
7. Have students take notes in their notebooks.
8. Have students try the four examples on page 26 at bottom.
9. Have calculator sequence written out by students in notebook.
10. Have students select 5 to 10 homework problems from Cognitive Tutor IM 1 textbook used in class.
11. Students must write calculator sequence for each problem, due next class.

Student handouts include:
1. Sheet page 26 from Easy Warm Ups.
2. IM 1 page 8-17 thru 8-24.
3. Notes from board.
4. Ti-83+ graphing calculator.

Answer Key:
1. See answer key Easy Warm Ups page 33 and 34.
Day 2:

**Objective:** Students will be able to solve quadratic equations by graphing with the Ti-83+ graphing calculator provided. The students will be able to enter correct key sequences and record what the sequences are on a separate sheet of paper.

**Outline of the activity with instructions for the teacher:**
1. Go over homework from day one.
2. Set up Ti-83 cable and overhead unit.
3. Pass out Ti-83 calculators to students.
4. Use page 27 in the Easy Warm Ups as a guide to give the lesson.
5. Demonstrate on overhead.
6. Demonstrate again having students follow along.
7. Have students write down calculator key sequences as we go.
8. Have the students do numbers 1 thru 4 on page 27 while writing down sequences.
9. Have the students sketch their discovery on the sheet provided.
10. Walk around and check for understanding.
11. Find solution by graphing four more quadratic equations given out as hand out number one.

**Student handouts include:**
1. Sheet page 27 Easy Warm Ups numbers 1 thru 4.
2. Hand out number one.
3. Ti-83 calculator.

**Answer key:**
1. See key Easy Warm Ups pages 33-34.
2. See key 1b.
Day 3:

Objective: The students will graph exponential equations using the Ti-83 calculator. This will be completed by applying knowledge from the previous two lessons.

Outline of activity with instructions for teacher:
1. Go over homework from previous day.
2. Get overhead ready and calculators passed out to students.
3. Have students copy notes off board from page 28 Easy Warm Ups with steps involved with graphing exponential equations.
4. Model the example on page 28 on the overhead copying down calculator key sequences involved.
5. Have students follow the second time through.
6. Have students sketch what they see in viewing area of notes.
7. Students will try numbers one thru four page 28 Easy Warm Ups with steps involved written down.
8. These will be due tomorrow in class and will call for explanation if called upon.

Student handouts include:
1. Numbers 1 thru 4 page 28 Easy Warm Ups.
2. Notes from board and on sheets.
3. Ti-83 calculator.

Answer key:
1. Easy Warm Ups pages 33-34.
Day 4:

**Objective:** Students will be able to graph rational functions using the Ti-83 calculator. They will be able to recall prior knowledge to solve examples and teach others how to solve the problems.

**Outline of activity with instructions for teacher:**
1. Go over number 1 thru 4 from previous day with students giving direction on “how to” from their seats while the rest of the class listens and follows along. Correct any mistakes and ask questions if necessary.
2. Use overhead and Ti-83 calculator for instruction.
3. Model the example from page 29 together with taking notes on calculator sequences involved.
4. Students will work in groups of 2-3 on examples one thru four of Easy Warm Ups page 29.
5. Instructor assesses groups for knowledge and understanding by walking around and asking questions.
6. Students will make up their own rational functions to graph with sequences to present to the class for tomorrows homework.

**Student handouts include:**
1. Page 29 Easy Warm Ups numbers 1 thru 4 and notes.
2. Ti-83 calculator.

**Answer key:**
1. Easy Warm Ups pages 33-34.
Day 5:

Objective: The students will be able to graph radical functions. The students will be able to access prior knowledge of graphing to perform the tasks. They will be able to teach each other to do the same.

Outline of activity with instructions for teacher:
1. Do presentations of problems from exponential functions with partners using instructors overhead unit.
2. Prepare overhead Ti-83 and pass out calculators to students.
3. Teacher demonstration on overhead using page 30 Easy Warm Ups as a guide.
4. Students will follow, demonstrate and take notes accordingly.
5. Have students perform demonstration on their own with calculator sequence written down in their notes.
6. Have the students complete the four examples on page 30 Easy Warm Ups on their own with calculator and sequences written down.
7. Instructor will go around and help out students in need and check for understanding.
8. Students will use computer Internet access to graph two additional examples of radical functions from a list of math sites provided.
9. The students will write out problems, sketch what they see, and write out calculator key sequences.
10. Students must list the URL and author of the web site in which they found both radical functions.

Student handouts include:
1. Page 30 Easy Warm Ups numbers 1 thru 4.
2. Ti-83 graphing calculator.
3. List of math web sites on the board.

Answer key:
1. Easy Warm Ups pages 33-34.
**Day2 Handout:**

Homework: Solve the quadratic equations using your Ti-83+ calculator with key sequence written out. Sketch what you see on your display.

1. \( Y=x^2+1 \)

2. \( Y=x^2-3 \)

3. \( Y=x^4+4 \)

4. \( Y=x^2-10 \)
**Conclusion:** I completed this unit plan with both of my IM 1 Algebra classes in five full class periods. These lessons went very smooth and the students enjoyed them very much. The students really appreciated the ease of using the Ti-83+ graphing calculator. I have a blind student and aide in one of my classes that found the discovery of the graphing calculator to be fun and informative. I taught a non-math teacher aide to perform the graphing functions with ease and accuracy. The students loved using the calculators each day and it really mixed things up. I used multiple sheets and handouts from Easy Warm Ups and Cognitive Tutor throughout the unit plan. These sheets provided additional examples/direction for students to use and refer to. Having students create their own homework and problems to graph along with presentations to peers seemed to have a very positive influence on learning. The students loved the fact that they had a say in what we did. This involved the students in the learning process. Having the students write out the key strokes really helped with recall. The best part was having them teach each other in groups and in front of the class, teaching is mastery learning. Thank you for all the materials and knowledge I gained from I2T2.