

ClassPad 101

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for ClassPad Version 3.04

Lesson 21

Introduction to Statistics in Spreadsheet

Welcome

In this lesson we will explore features of the ClassPad that allow us study Statistics in a new way using Spreadsheet. The possibilities are endless!

Lesson Goals

- To understand what a residual plot is
- To be able to decide which regression better fits the data based on residuals
- To understand how the degrees of freedom affects the graph of a t distribution

In Lesson 21, you will learn how to:

- Fill a range of cells
- Draw a regression curve
- Place residual values for a regression in Spreadsheet
- Generate statistical values for multiple inputs at one time
- View multiple graphs quickly
- Output data from Statistics to Spreadsheet
- View probabilities based on multiple degrees of freedom graphically

Upon completion of this lesson, you will be able to answer the following questions:

1. What makes up the coordinate point of a point in a residual plot?
2. How can we estimate from a residual plot whether or not the regression will pattern the population accurately?
3. How do we put residual data in Spreadsheet?
4. Is a t distribution graph more spread out or less spread for small degrees of freedom numbers?

Time required

About 50 minutes.

Getting Started

We will begin by looking at residual plots to help us decide if there is unusual behavior with our data and choice of regression.


Recall:

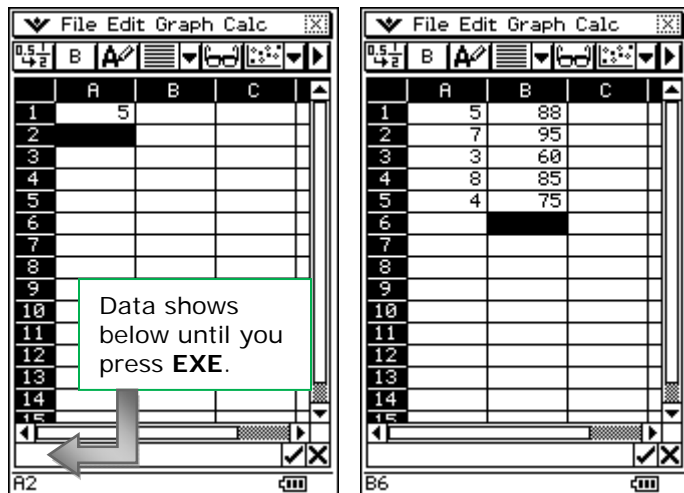
When we plot ordered pairs of the form $(x, \text{residual})$, the plot is called a **residual plot**.

Residual plots that exhibit a random plot within the same area usually indicate that the regression model selected will pattern the population accurately.


Residual plots that exhibit a pattern or a point/s that are unusually larger spread than most indicate that we should be careful!

1. Inputting Data of the Form (student #, test score)

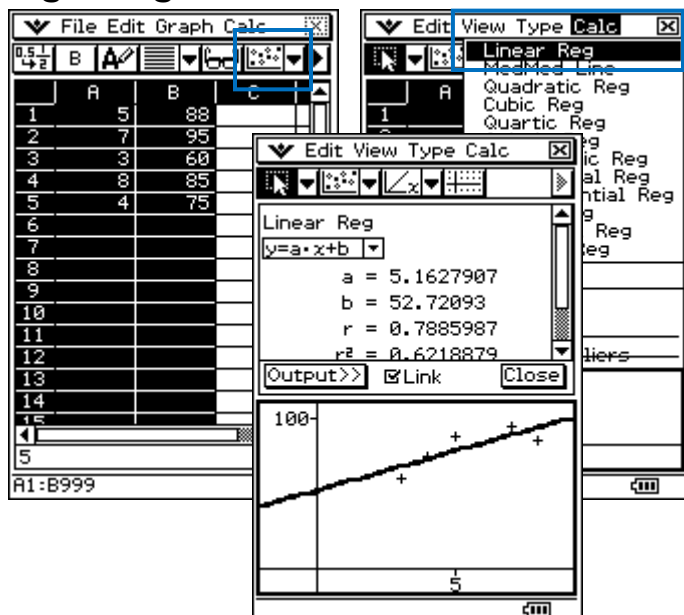
- Open  and clear the window (if needed)
- Select cell **A1**, input **5** and press **EXE**
- Input the remaining data shown



2. Plotting Data and Drawing a Regression

- Click on column A and drag across to select both columns
- Click  to draw a scatter plot
- While the Graph window has focus, select **Calc/Linear Reg**
- We have results!

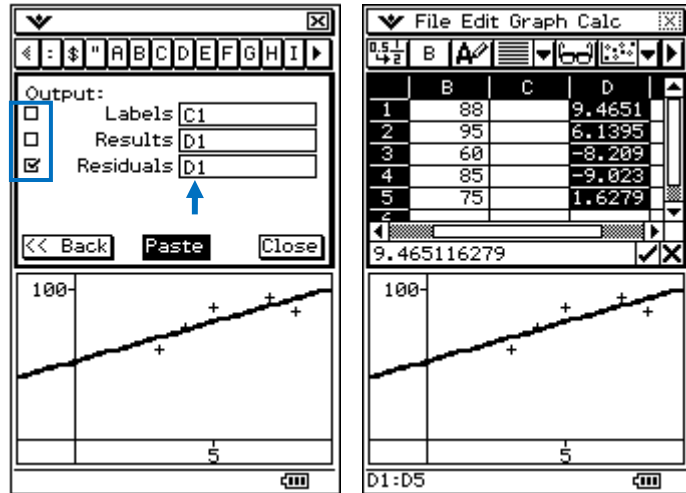
At this point, you could select a single point in the graph window and drag it. If **Link** is checked, the Linear Reg data will update automatically. However, you may want to wait until you finish Part I activities!



3. Outputting Residuals to Spreadsheet

- Click **Output>>** in the upper window
- Uncheck Labels and Results
- Check Residuals and change **E1** to **D1**
- Click **Paste**
- Close the Output window (using the upper **X**)

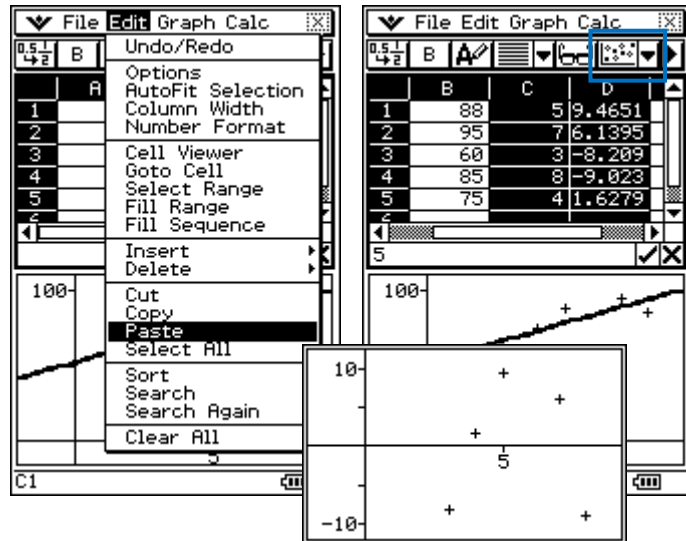
Our residual data was pasted into column D.



4. Drawing a Residual Plot

- Scroll to see Column A
- Select** Column A
- Select **Edit/Copy**
- Select cell C1
- Select **Edit/Paste**
- Scroll to see Column D
- Click on Column C and drag to select Column D
- Click to draw a scatter plot

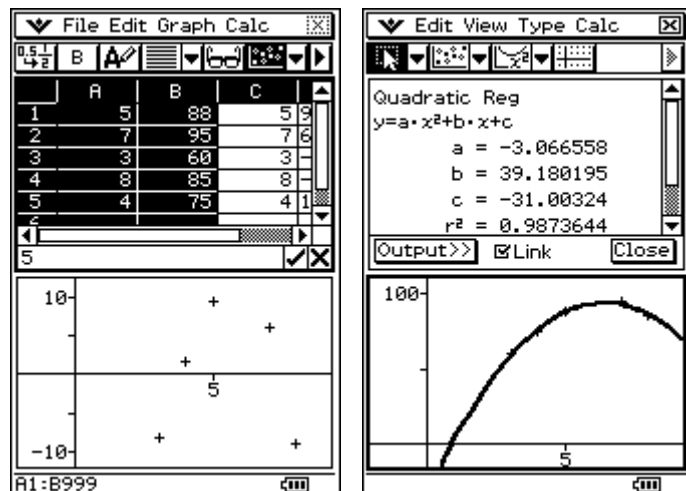
Note that the residual values seem large.



5. Trying Another Regression Curve

- Select columns **A** and **B**
- Click to draw the original scatter plot
- Select **Calc/Quadratic Reg**

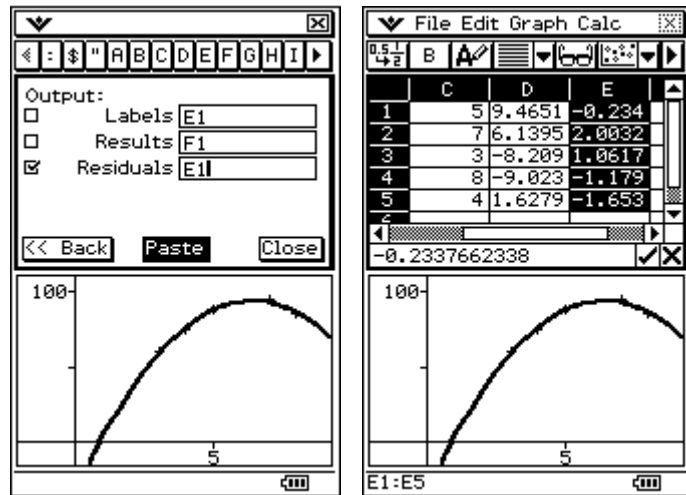
This seems to fit better and notice r^2 is much closer to 1!



6. Comparing Residual Values

- Click **Output**>> in the upper window
- Uncheck Labels and Results
- Check Residuals and change **G1** to **E1**
- Click **Paste**
- Close the Output window (using the upper **X**)

Notice the new residual values are much smaller.

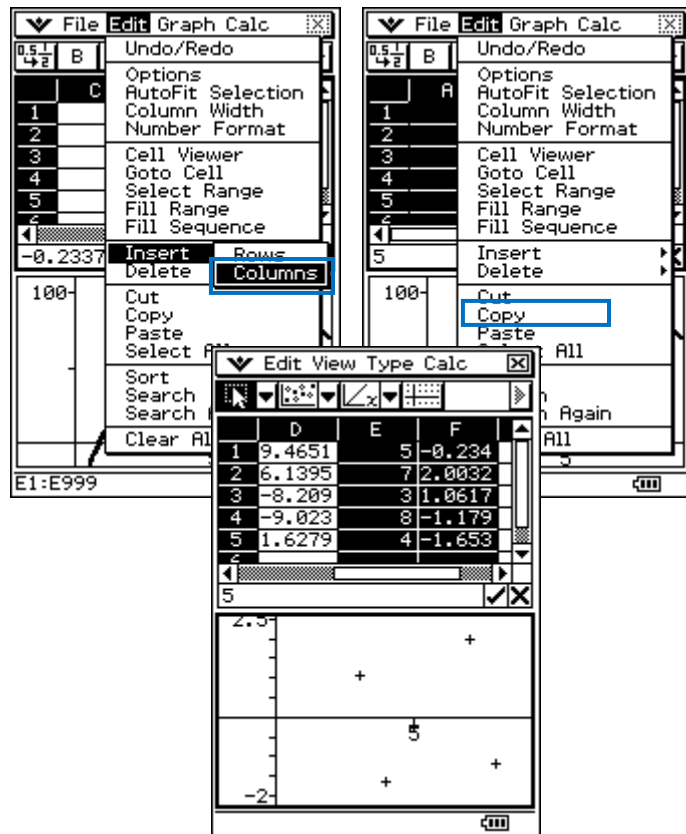


7. Drawing the Second Residual Plot

Before drawing the second residual plot, we need to place the data in Column A in front of Column E. To do this, we will first insert a column in front of Column E.

- Select** Column E
- Select **Edit/Insert/Columns**
Notice the residual data was shifted to Column F
- Select** Column A
- Select **Edit/Copy**
- Select cell E1
- Select **Edit/Paste**
- Scroll to see Column F
- Click on Column E and drag to select Column F
- Click to draw a scatter plot

Note that the residual values look random!



PART I

Practice Exercises

Before beginning the practice exercises, open a word document, type in the following information and then save it as Lesson21 in your CASIO folder within My Documents:

- Date: (enter today's date)
 - To: (put your instructor's name here)
 - From: (put your name here)
 - Re: Lesson 21
1. Please begin by opening the **Spreadsheet** application. Clear the window.
 2. Input **=rand(1,20)** into cell **A1**.
 3. Copy cell **A1** (select it and press Ctrl+c or Edit/Copy).
 4. Select cells **A2 to A20**. Hint: Press on A2 (do not let go) and drag to A20.
 5. Select Column A and draw a scatter plot. The x-values are assumed to be 1 to 20.
 6. With your scatter plot and spreadsheet showing, get a **screen capture**. Paste it into your Lesson21 document (under a title of PART I).
 7. Select Calc/Linear Reg. *Make sure* the DispStat box is checked in the Calc menu!
 8. Click Output>> and uncheck Labels and Results.
 9. Check Residuals and change the cell to begin the paste in from D1 to B1.
 10. Click Paste and close the output window.
 11. Select just Column B and draw a scatter plot. The x-values are assumed to be 1 to 20.
 12. With the residual plot and spreadsheet showing, get a **screen capture**. Add two blank spaces following the first screen capture and then paste this one.
 13. Select just Column A and draw a scatter plot.
 14. This time, select Calc/Cubic Reg.
 15. Click Output>> and uncheck Labels and Results.
 16. Paste the residuals beginning in cell C1 and close the output window.
 17. With the spreadsheet showing, get a **screen capture**. Add two blank spaces following the last screen capture and then paste this one.

PART II

In this part, we will experiment with the t distribution and degrees of freedom.

Recall:


If a sample size is small (usually $n < 30$), we should use the t distribution instead of the standard normal distribution.

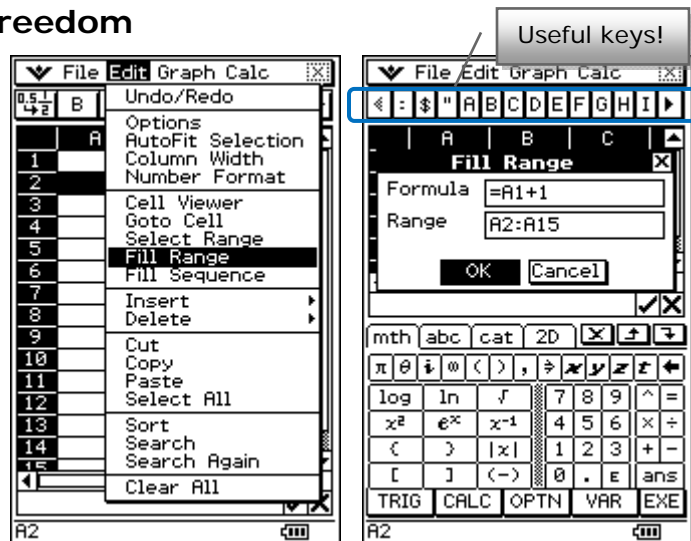
The t distribution and standard normal distribution are bell shaped and centered at zero.

For a standard normal distribution, the probability of being within 1 unit of $\mu = 0$ is approximately 68.27%.


For a t distribution, the probability depends on the degrees of freedom.

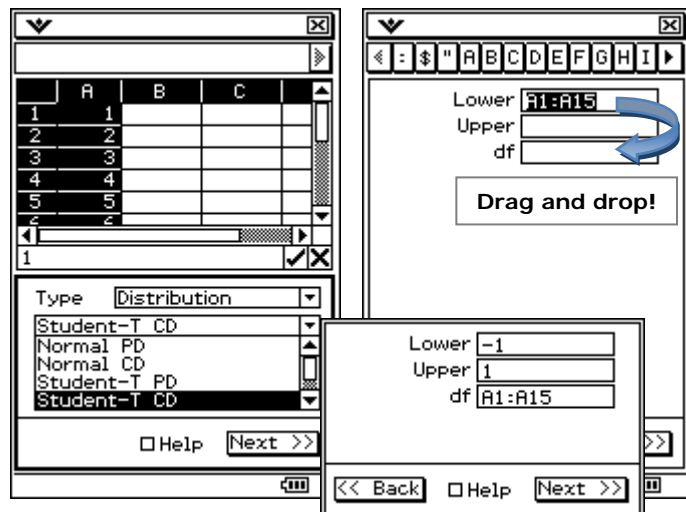
1. Inputting Degrees of Freedom

- Open  and clear the window (if needed)
- Input 1 in cell A1 and press **EXE**
- Select **Edit/Fill Range**
- Input the formula and range shown
- Click OK!




2. Locating the t distribution

- Select Column A
- Select **Calc/Distribution**
- Open the dropdown list
- Select **Student-T CD**
- Click **Next >>**
- Resize the window (Ctrl+r or )
- Press on the selected **A1:A15** and drag to the **df** field
- Set **Lower** to -1 and **Upper** to 1

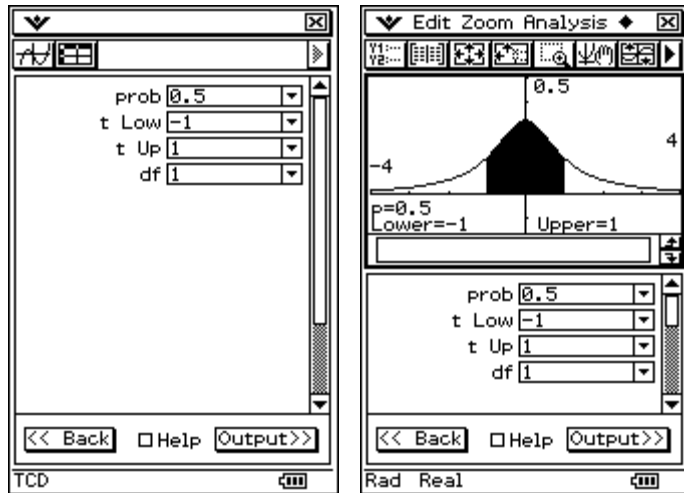


3. Getting Started with Exploration

- Click **Next>>**
Hmm... This will be interesting!
- Click the  button

We now have the graph of a t distribution of **df 1**. Notice that the area (probability) between -1 and 1 is 0.5.

For the standard normal curve, it is approximately .6827

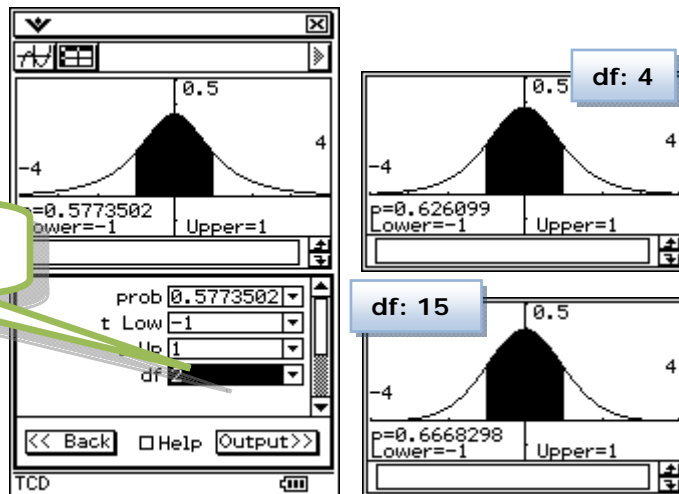


4. Exploring Shape as the Degrees of Freedom (df) Increases



- Change **df to 2** (Press the ClassPad's cursor key down arrow or the computer's down arrow)
- Another way** to change df:

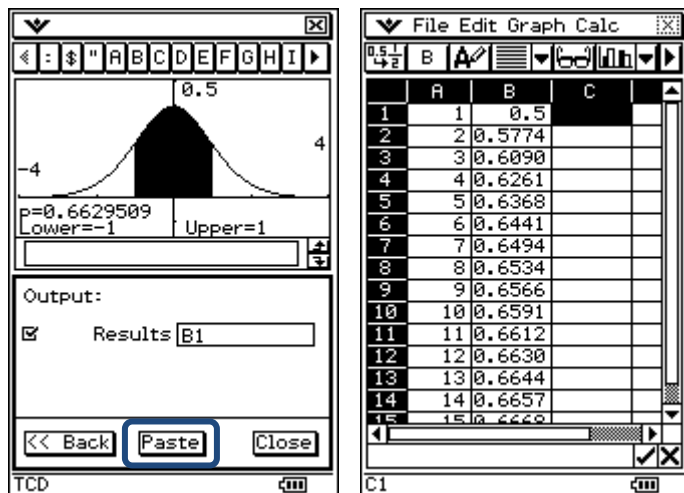
Highlight and press a down arrow

- Repeat for df from 3 to 15
Is the graph becoming more "normal"?





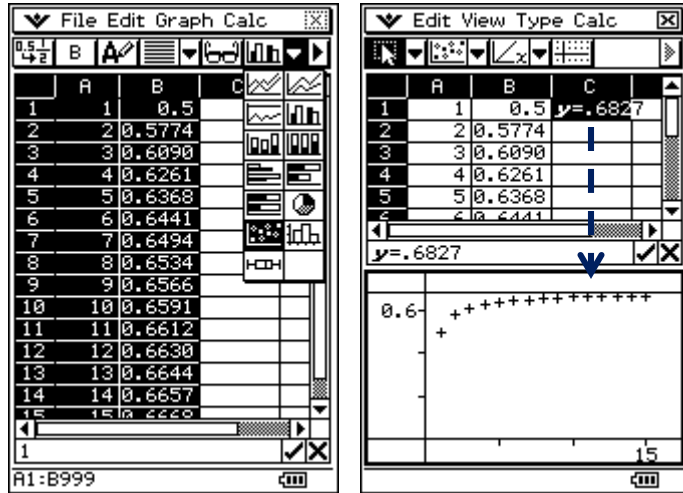
5. Outputting Data to Spreadsheet

- Click **Output>>**
- Make sure **Results** is checked
- Click **Results** to paste the prob values starting at B1
- Close the Output window (using the upper )
- Click in Spreadsheet to give it focus
- Resize the window (Ctrl+r or )



6. Viewing Probability as Degrees of Freedom (df) Increase Graphically

- Select columns **A** and **B**
- Click the second  on the toolbar
- Select 
- Select cell **C1** and input **y=.6827**
- Press **EXE**
- Select cell C1 again and let go
- Press on cell C1 and drag to the graph window
- Change cell A1 to 20 and press EXE ☺ Wow!!



PART II Practice Exercises

- Please begin by opening the **Spreadsheet** application. Clear the window.
- Input 1 into cell A1 and press EXE.
- Using Fill Range to place the numbers 2 to 30 in A2 to A30.
- Select column A and then Calc/Distribution.
- Change the distribution to Student-T CD.
- Click Next>> and drag A1:A30 to the df field.
- Set Lower to -2 and Upper to 2.
- Click Next>> and graph the result for df = 5.
- With the Stat and graph windows showing, get a **screen capture**. Paste it into your Lesson21 document (under a title of PART II).
- Change the df to 25. It may be easier to resize the window to scroll the df dropdown list box. Notice the graph updates automatically.
- With the Stat and graph windows showing, get a **screen capture**. Add two blank spaces following the first screen capture and paste this one.
- Click Output>> and then Paste.
- Close both windows to view the Spreadsheet window only.

14. Select columns A and B and draw a Scatter plot.
15. Change cell A1 to 30 and press EXE.
16. With the spreadsheet and scatter plot showing, get a **screen capture**. Add two blank spaces following the second screen capture and then paste this one.

PART III

Written Exercises

Please copy and paste the following questions into your Lesson21 document (under a title of Part III) and answer them.

1. What makes up the coordinate point of a point in a residual plot?
2. How can we estimate from a residual plot whether or not the regression will pattern the population accurately?
3. How do we put residual data in Spreadsheet?
4. Is a t distribution graph more spread out or less spread for small degrees of freedom numbers?

Reflection Exercises

You have just completed the twenty-first lesson in ClassPad 101. Please take a few moments to copy and paste the following three questions at the end of your Lesson21 document and answer them.

1. Approximately how long did it take you to complete this lesson?
2. Which activity did you enjoy the most?
3. Do you have suggestions for a third activity?

Assessment 21: Introduction to 3D Graphing

- **Checkpoint:** Your word processed document, titled "Lesson21", should contain the following activities:
 1. Three screen captures from PART I.
 2. Three screen captures from PART II.
 3. Four questions with answers and three reflection questions with answers from PART III.
- **Submit** your **Lesson21 document** to your instructor for grading. Once your lesson is submitted, your lesson for ClassPad 101 "Introduction to Calculus on the ClassPad" is complete.