MEDU 2010 **Name:** _____
Fall 2017
Professor K. Poirier
Final Exam
December 19, 2017

Complete **three** of the four components below. Submit your work in an email to kpoirier@citytech.cuny.edu and/or in your blue book.

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1. **GeoGebra Component**

   Create a GeoGebra document according to the following instructions. You may attach the .ggb file to your email or upload your file to your online GeoGebra account and include the link in the body of your email. Make sure your file is viewable by anyone with the link.

   (a) Construct a circle and a hexagon ABCDEF whose vertices lie on the circle.

   (b) Denote the intersections of opposite sidelines of the hexagon ABCDEF by L, M, and N respectively. (A *sideline* is the infinite line that coincides with the side of the hexagon.)

   (c) Make a precise conjecture about the relationship among L, M, and N. Type your conjecture in a text box. Use full sentences. (Hint: it may be helpful to hide the hexagon's sidelines.)

   (d) Use the drag test to test your conjecture. If your conjecture fails the drag test, replace your conjecture with one that passes the drag test.

   (e) Does the drag test constitute a proof of your conjecture? Why or why not? Create a second text box with your answer.

2. **Demos Component**

   Create an activity in the Desmos Activity Builder. Save your activity and create a class code. Include the class code in the body of your email.

   (a) Log into your Desmos account at teacher.desmos.com.

   (b) Create an activity to deliver a short in-class lesson on one of the following topics. Use the Desmos tools to the best of your ability. Your activity must use at least 3 slides.

   - transformations of graphs of functions (you may restrict your attention to one type of function if you like)
   - introduction to exponential and logarithmic functions
   - introduction to trigonometric functions
   - another topic of your choosing (get permission first)

   (c) Save your activity and include the class code in the body of your email.

3. **Graphing Calculator Component**

   Each of the following examples demonstrates a weakness of the TI graphing calculator. Choose **one** of the examples and write a 2-3 paragraph description of the problem. You may write your essay by hand in your blue book or you may type it to send it in the body of your email. You may wish to draw screens from your calculator and/or Desmos.

   - Imagine you are trying to help your students understand $\lim_{n\to\infty}(1+\frac{1}{n})^n$. Try substituting larger and larger numbers for n in your calculator. What do you expect to see? What do you notice?

- Graph the function $f(x) = \sqrt{4 - \ln(x)}$ on your calculator. What behavior do you expect near the y-axis? Do you see it on the calculator's graph? Compare the graph your calculator gives you with the graph Desmos gives you.
- Graph the functions $f(x) = \sin(10x), g(x) = \sin(100x), h(x) = \sin(1000x)$ on your calculator. Do you see what you expect to see? Do you notice anything weird? What happens if you graph the same functions on Desmos?
- Graph the function $f(x) = \sin(\ln(x))$ on your calculator in the window $[0, 1]$ for x and $[-1, 1]$ for y. How many roots does it look like there are in $[0, 1]$? Change the window to $[0, 0.1]$ for x and then to $[0, 0.01]$ for x with the same y-values.What has happened to the roots? Try graphing the same function in Desmos.
- In the standard window on your calculator, graph the piecewise defined function $f(x) = 3x - 2$ if $x < 1.5$ and x^2 if $x \geq 1.5$. Ask the calculator to tell you the derivative at $x = 1.5$. Is this what you were expecting? Try graphing the function on Desmos.
- Use the equation solver on your calculator to solve $\frac{\sin(x)}{x} = \frac{1}{x}$. How many solutions do you expect? What does the calculator show?

4. **Research Article Component**

Choose **one** the following topics to write about in a 3-5 paragraph essay. You may write your essay by hand in your blue book or you may type it to send it in the body of your email. Indicate clearly which option you are choosing.

(a) The articles mentioned the importance of training teachers to use technology in the classroom. What constitutes effective teacher training? Use examples either from the articles or from your own experience (or both).

(b) The research articles demonstrated that there were different types of barriers to integrating technology effectively in a math classroom. Choose one of the two barriers from the articles and explain how you would address it or overcome it if you encountered it in your own teaching career.

(c) There are situations in a math class for which it would be appropriate to use technology and situations for which it would not be appropriate. Discuss one situation (either from the articles, from your experience, or from your imagination) where the use of technology was appropriate and describe why. Discuss one situation (either from the articles, from your experience, or from your imagination) where the use of technology would *not* be appropriate and describe why. What differentiates these two situations? How can we help students learn about when the use of technology is appropriate and when it is not? How can we integrate technology as learning tools without overwhelming students or distracting them from the mathematical content they are learning?

(d) If there is another topic you are interested in writing about, you may get permission from the instructor to write about it here. It must examine some feature of technology in math education and be supported by examples from the research articles or from your own experience. Be as specific as possible. Make sure you describe the topic clearly.