Limit of Sin(*x*)/*x*

Name _____

Class _____

Part 1 – Graphical Limit

1. Open up a new TI-Nspire document and insert a *Graphs* page.

2. Graph the function $f(x) = \dfrac{\sin(x)}{x}$ by typing **sin(x)/x** in the function entry line at the bottom of the screen and press (enter).

3. Zoom in where *x* is indeterminate. Press **MENU > Window/Zoom > Window Settings** and change the XMin, XMax, YMin, and YMax values.

4. Place a point on the function. Press **MENU > Points & Lines > Point On**. Move the cursor to the graph and press (enter).

5. Grab the point and move it toward *x* = 0.

   - What does the *y*-value equal as you move the point from the right toward *x* = 0?

   - What does the *y*-value equal as you move the point from the left toward *x* = 0?

   - Are the *y*-values the same or different?

Part 2 – Numerical Limit

1. Insert a *Lists & Spreadsheet* page.

2. Set up automatic data capture. In gray cell of Column A, type **=capture(rightlim,1)** and press (enter). In the gray cell of Column B, type **=capture(leftlim,1)** and press (enter).

3. Go back to the *Graphs* page. Place a second point on the function. One point needs to be to the right of the *y*-axis and the other to the left of the *y*-axis.

4. Link the variable names. On the *y*-value of the right point, click once. Press (var), select **Store Var**, and type **rightlim**. Repeat for the left *y*-value using **leftlim**.

5. Grab the right point and move it toward *x* = 0. Then grab the left point and move it toward *x* = 0. *Do not cross the y-axis!*

6. The values of the function will be captured on the spreadsheet. Scroll down the columns to see the *y*-values as the *x*-value approaches zero from the left and right side.

   - What do the values in Column A approach?

   - What do the values in Column B approach?

   - Are the *y*-values the same or different?

   - What is the $\lim\limits_{x \to 0} \dfrac{\sin(x)}{x}$?

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Part 3 – Algebraic Limit

1. Insert a *Calculator* page.

2. Press (⊡{⊟}) and select the limit template. Enter the information as shown below. Using a minus sign will calculate the left-hand limit. Change the minus to a plus to calculate the right-hand limit.

   - $\lim\limits_{x \to 0^-} \dfrac{\sin(x)}{x} =$

   - $\lim\limits_{x \to 0^+} \dfrac{\sin(x)}{x} =$

3. When the left-hand limit equals the right-hand limit, the limit exists. Complete the limit template without a minus or plus sign to determine the limit.

   - $\lim\limits_{x \to 0} \dfrac{\sin(x)}{x} =$

Practice Problems

Use the graph, spreadsheet, and calculator pages to determine the limit of the following problems.

1. $\lim\limits_{x \to 1} \dfrac{x-1}{x^3-1}$

2. $\lim\limits_{x \to 0} \dfrac{1-\cos(x)}{x^2}$

3. $\lim\limits_{x \to 0} (1+x)^{\frac{1}{x}}$