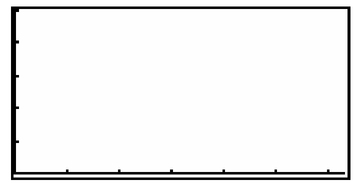
Assignment 12: Integration and Riemann Sums (4.1-4)Name____________________
Please provide a handwritten response.

1a. To approximate the area under the graph of $f(x) = \cos x$ on the interval $\left[0, \frac{\pi}{2}\right]$ graph $f(x)$ over $\left[0, \frac{\pi}{2}\right]$ and sketch the results below.



$0 \le x \le \frac{\pi}{2}, 0 \le y \le 1$

1b. Now use 50 rectangles to approximate the area under this curve. You will use the program **RIEMANN** to perform this approximation. You will need to place $y_1 = \cos x$ in your graphing menu. After exiting the graphing menu run the program **RIEMANN**. You will need to enter $a = 0,\ b = \frac{\pi}{2},\ n = 50$. Note that the program is using $\Delta x = \frac{b-a}{n}$. Record the value being used for Δx below.

1c. The Riemann sum for left-hand evaluation $\sum_{i=1}^{n} f(x_{i-1})\Delta x$ can be found using the same program. It is given as result **L** in the program. Run the program **RIEMANN** and record the result for left-hand evaluation below. Is it a plausible approximation of the area?

1d. The Riemann sum for right-hand evaluation $\sum_{i=1}^{n} f(x_i)\Delta x$ can be found using the program. It is given as result **R** in the program. Run the program **RIEMANN** and record the result for right-hand evaluation below. Is your answer greater or less than your result in part **c**? Why should this be so?

1e. Likewise, the Riemann sum for midpoint evaluation $\sum_{i=1}^{n} f\left[\frac{1}{2}\left(x_{i-1}+x_i\right)\right]\Delta x$ can be found using the same program. It is given as result **M** in the program. Run the program **RIEMANN** and record the result for midpoint evaluation below.

1f. Now approximate the area using 100 rectangles. To rerun the program after you quit, press **ENTER** and the program will again prompt you to enter **a, b,** and **n.** This time enter **n=100** and record the three results below. Do the three approximations in parts **c-e** become more spread out or closer together? Record the results below. Is this what you would expect?

2. The exact value of the area you approximated can be found using the definite integral $\int_0^{\pi/2} \cos x\, dx$. The definite integral is found using the **fnInt** command.

	TI-83 Plus/TI-84 Plus	**TI-86**
FINDING THE DEFINITE INTEGRAL	**MATH 9 fnInt(** Enter: function,X,low limit, high limit) provided X is the variable	**2ND CALC F5 fnInt** Enter: (function,x,low limit,high limit) provided x is the variable

Execute **fnInt** $\left(\cos x, x, 0, \frac{\pi}{2}\right)$ and record the results below. Based on the evidence you have already gathered, is this answer plausible?