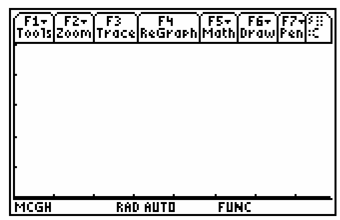
Assignment 12: Integration and Riemann Sums (4.1-4)Name____________________
Please provide a handwritten response.

1a. The $\int$ command is used to find both indefinite and definite integrals. To find $\int\left(4x-2\sqrt{x}\right)dx$ you enter $\int\left(4x-2\ddot{O}\left(x\right),x,c\right)$. Is the answer correct? Did the calculator record the **+C**?

1b. Next evaluate $F\left(x\right)=\int\frac{2x^3}{x^4+1}dx$ as $\int\left(2x\wedge 3/\left(x\wedge 4+1\right),x,c\right)$ and record the results below.

1c. By definition of antiderivative, what should $F'\left(x\right)$ be? Differentiate your solution to **1b** using the ***d*( )** command (you can paste F' into this command as you did in **Assignment 10**) and record the result below. Is it correct?

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



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

2b. 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 by typing **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.

2c. The Riemann sum for left-hand evaluation $\sum_{i=1}^{n}f\left(x_{i-1}\right)\Delta x$ can be found using **riemann( ).** It is given as result **left sum** in the program **riemann( )** . Is it a plausible approximation of the area? Record the result for left-hand evaluation below.

2d. The Riemann sum for right-hand evaluation $\sum_{i=1}^{n} f(x_i)\Delta x$ can be found using the same program. It is given as result **right sum** 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?

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

2f. Now approximate the area using 100 rectangles. To rerun the program after you quit, press **ENTER** with **riemann( )** in the entry line (you should not have to retype it) 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? Is this what you would expect?[1]

3. 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 $\int$ command. Execute $\int(\cos(x), x, 0, \pi/2)$ and record the results below. Based on the evidence you have already gathered, is this answer plausible?

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[1] The Trapezoidal Rule and Simpson's rule for Assignment 13 are included in this program. Bypass them by pressing ENTER twice and use 2nd QUIT to exit the program.