2. (7 points) Use a Riemann Sum with 4 equal subdivisions to find a ***lower*** estimate for

$$\int_0^2 e^x + 1\,dx.$$

Clearly indicate whether you are using a left-hand sum or a right-hand sum, and show all intermediate calculations. Show your answer to three decimal places (or in exact form).

The function is increasing, therefore the Left Sum is the lower sum.

x	0	$\frac{1}{2}$	1	$\frac{3}{2}$	2
e^x+1	2	$e^{1/2}+1$	$e+1$	$e^{3/2}+1$	e^2+1
e^x+1	2	2.6487	3.7183	5.4817	8.3891

Left Sum

$$LHS_{(4)} = (0.5)(2) + (0.5)(e^{1/2}+1) + (0.5)(e+1) + (0.5)(e^{3/2}+1) = 6.9243$$

3. (7 points) Let $f(x) = \cos(x) + bx$ and $g(x) = x^2 - x$. Find the value of b such that $f(x) > g(x)$ on $[0, 1]$ and the area between the curves from $x = 0$ to $x = 1$ is equal to 1.

$$1 = \int_0^1 \cos x + bx - (x^2 - x)dx$$

$$1 = \sin(1) - \frac{1}{3} + \frac{b+1}{2}$$

$$b = \frac{5}{3} - 2\sin(1) = -0.0162753$$

[Note that with this value of b, $f(x) > g(x)$ on $[0, 1]$–but, with the set-up of the problem as indicated above, we are assuming that $f(x) > g(x)$ on the interval.]