UCLA MATH 151A, WINTER 2000, MIDTERM, FRIDAY, FEBRUARY 9

NAME ______________________________ **STUDENT ID #** __________________

This is a closed-book and closed-note examination. No calculators are allowed. Please show all your work. Partial credit will be given to partial answers. There are 2 problems of total 20 points.

PROBLEM	1	2	3	4	5	TOTAL
SCORE						

Let $f(x) = \frac{1}{2^x}$ and $x_0 = 0$, $x_1 = 1$, $x_2 = 2$.

1. Determine P_2, the Lagrange interpolating polynomial, of degree at most 2, which agrees with f at x_0, x_1, x_2.

2. Use the following table to estimate $P_2(1.5)$ with a two-digits with a two-digits chopping arithmetic.

x	x^2	$\frac{1}{8}$	$\frac{5}{8}$
1.5	2.25	0.125	0.625

3. Use the Theorem of the course to find a bound of the absolute error between $f(1.5)$ and $P_2(1.5)$. (You can use the fact that $(ln(2))^3 \leq \frac{1}{3}$, $\frac{1.5}{24} = 0.0625$ and $\frac{0.0625}{3} = 0.0208$.) Knowing that $f(1.5) = 0.3535$, compare to the results you obtained and conclude.

Let $f(x) = x - 2\,cos(x)$

1. Proove that the equation $f(x) = 0$ admits a solution p in the interval $[0, \frac{\pi}{2}]$.

2. Use the following table to determine the first steps of the bisection method when starting with the

x	0	$\frac{\pi}{16}$	$\frac{2\pi}{16}$	$\frac{3\pi}{16}$	$\frac{4\pi}{16}$	$\frac{5\pi}{16}$	$\frac{6\pi}{16}$	$\frac{7\pi}{16}$	$\frac{8\pi}{16}$
$f(x)$	-2	-1.76	-1.45	-1.07	-0.62	-0.12	0.41	0.98	1.57

points 0 and $\frac{\pi}{2}$. You will sumarize your results in this table

n	a_n	b_n	p_n	$f(p_n)$
0	0	$\frac{\pi}{2}$		
1				
2				
3			...	...

3.