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MATH 4670
October 6, 2005

1 Section 2.4, Problem 4.c.

Using the Secant method, we will find solutions accurate to within 10^{-5} for the equation

$$e^x - 3x^2 = 0$$

on the intervals $[0, 1]$ and $[3, 5]$.

2 Source Code

The following C code can be used to find an accurate value:

```
#include <stdlib.h>
#include <math.h>

#define E 2.71828182846
double f(double x);
void secant_method(double a, double b);

int main()
{
    secant_method(0, 1);
    secant_method(3, 5);
    return 0;
}

double f(double x)
{
    return pow(E, x) - 3 * pow(x, 2);
}

void secant_method(double a, double b)
{
    double x[100];
    unsigned int k = 1;
    x[0] = a;
    x[1] = b;

    printf("%d \t %5.20f \t %5.20f \n", 0, x[0], f(x[0]) );
    printf("%d \t %5.20f \t %5.20f \n", 1, x[1], f(x[1]) );
```

```

while( f(x[k]) != f(x[k-1]) )
{
    x[k+1] = x[k] - ( f(x[k]) * (x[k] - x[k-1]) ) / ( f(x[k]) - f(x[k-1]) );
    printf("%d \t %5.20f \t %5.20f \n", k+1, x[k+1], f(x[k+1]) );
    k++;
}
printf("\n");
}

```

3 Results

	x	f(x)

0	0.00000000000000000000	1.00000000000000000000
1	1.00000000000000000000	-0.28171817154000011740
2	0.78020271710627908668	0.35576569272981228842
3	0.90286673574521814079	0.02115923215751591702
4	0.91062353889634672921	-0.00183360060643666944
5	0.91000496009364184591	0.00000777370348092887
6	0.91000757153889011430	0.00000000282717427247
7	0.91000757248897745644	-0.000000000000000455191
8	0.91000757248897590213	0.000000000000000011102
9	0.91000757248897590213	0.000000000000000011102

0	3.00000000000000000000	-6.91446307679117211364
1	5.00000000000000000000	73.41315910283722701024
2	3.17215654812560154951	-6.32884975467992738629
3	3.31722621401097628180	-5.42823628953311931866
4	4.19159957766157553749	13.41996299334219244770
5	3.56904365035788595506	-2.73157462731252564936
6	3.67433133349036333826	-1.07984456617056423511
7	3.74316481614593055127	0.19758509214989317115
8	3.73251806943474173650	-0.01088211575957842570
9	3.73307383612503285164	-0.00010078169200511411
10	3.73307903131767382376	0.00000005216568688127
11	3.73307902862997753601	-0.00000000000024513724
12	3.73307902862998997051	-0.00000000000000355271
13	3.73307902862998997051	-0.00000000000000355271

4 Summary

It is clearly shown that x converges to approximately 0.91000757248897590213 on the interval $[0, 1]$ and to approximately 3.73307902862998997051 on $[3, 5]$.