1) a) All my work was done by hand then copied to a digital format to ease reading when possible Newton method:

Xn	F(Xn)	F'(Xn)	Xn-Xn-1
1	-1	3	N/A
1.33333333	-0.182605044	2	0.33333333
1.424635855	-0.008970892	1.807735033	0.091302522
1.429598359	-2.42112E-05	1.797988662	0.004962504
1.429611825	-2E-10	1.797962308	1.34657E-05
1.429611825	0	1.797962308	1E-10
1.429611825	0	1.797962308	0

Secant method:

Xn	F(Xn)	F'(Xn)	Xn-Xn-1
1	-1	N/A	N/A
2	0.772588722	1.772588722	1
1.564146656	0.225214974	1.255866808	0.435853344
1.384816354	-0.082546216	1.716169476	0.179330302
1.432915459	0.005929147	1.839438849	0.048099105
1.429692114	0.000144351	1.794655983	0.003223345
1.42961168	-2.596E-07	1.797883883	8.04336E-05
1.429611825	0	1.797962449	1.444E-07

Here are the equations that I used for my B and C parts

b) I used $E_n = X_n - r$ to calculate the error estimate. since I don't actually know the correct exact root I used the last iteration calculated instead of r in my code.

For the newton method:

Xn	Error estimate
1	0.429612
1.33333333	0.096278
1.424635855	0.004976
1.429598359	1.35E-05
1.429611825	9.87E-11
1.429611825	0
1.429611825	Value used as root, thus 0

For the secant method:

Xn	Error estimate	
1	0.429612	
2	0.570388	
1.564146656	0.134535	
1.384816354	0.044795	
1.432915459	0.003304	
1.429692114	8.03E-05	
1.42961168	1.44E-07	
1.429611825	Value used as root, thus 0	

c) we know the error estimate is $E_n=X_n-r$ from part b, thus by using the newton formula

$$X_{n+1} = X_n - f(X_n)/f'(x_n)$$

$$E_{n+1} + r = E_n + r - f(X_n)/f'(x_n)$$

$$E_{n+1} = E_{n-1} f(X_n) / f'(x_n)$$

If what is meant by the question is to find the relative error however, then the answer would be: $|X_{n+1} - X_n| / |X_{n+1}|$

|d)

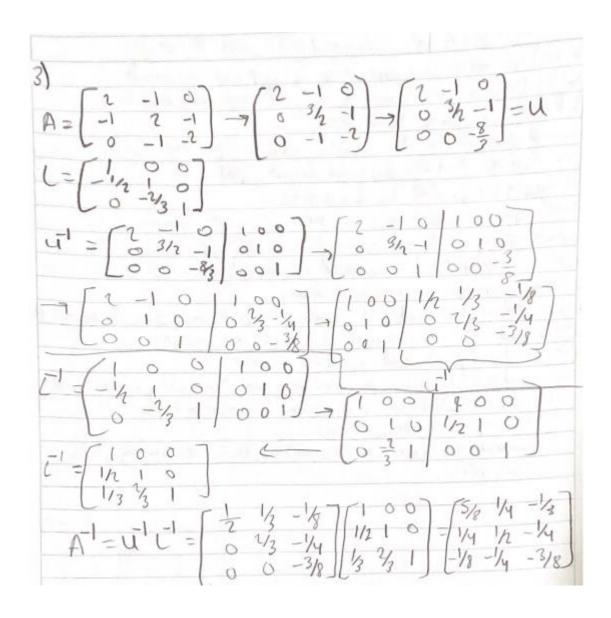
```
please enter max number of iterations: 6
  wton method iterates:
                                                         |Xn-Xn-1|
N/A
0.333333333
0.0913025218
0.0049625038
                     -0.1826050435
                                       1.7979623077
1.7979623075
1.7979623075
                                                          0.0000134657
   ton method errors: [0.4296118247255556, 0.09627849139222233, 0.004975969629117394, 1.3465829812986385e-05, 9.869105532800404e-11, 0.0]
Iton method convergence rates: [1.980844580838516, 1.9956021413565381, 1.999869969985465, nan, nan]
Secant method iterates:
                                                             |Xn-Xn-1|
                                       1.7161694759
1.8394388489
1.7946559830
                     -0.0825462164
                                                          0.1793303021
                                                          0.0480991053
0.0032233453
        method errors: [0.4296118247318659, 0.5703881752681341, 0.13453483120332188, 0.04479547084896951, 0.0033036344845749355, 8.028918980440558e-05, 1.444095529823386e-07]
method convergence rates: [-5.096384163786625, 0.7613157914036462, 2.370688057022437, 1.4257859638231163, 1.7004285330264914, nan]
sers\abdul\Desktop\numericHW2> [
```

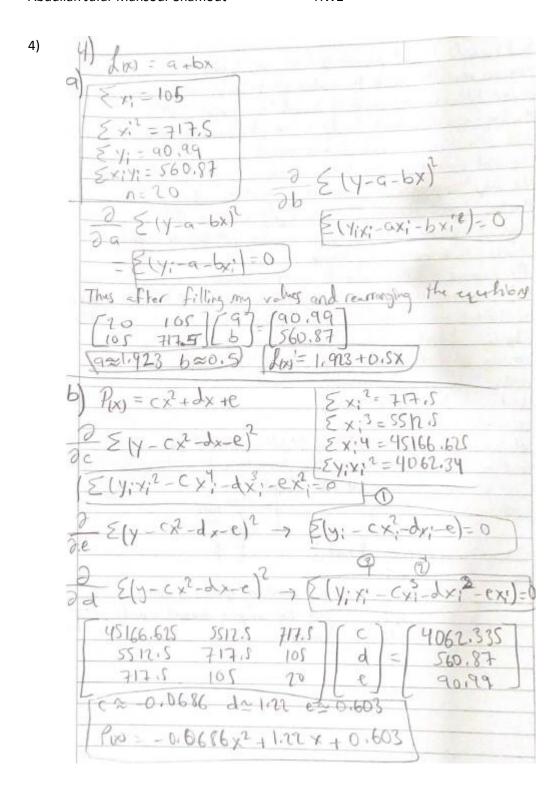
for my convergence calculation, since it was not explained in class I did some research and discussed the question with some other students, I decided to use this equation:

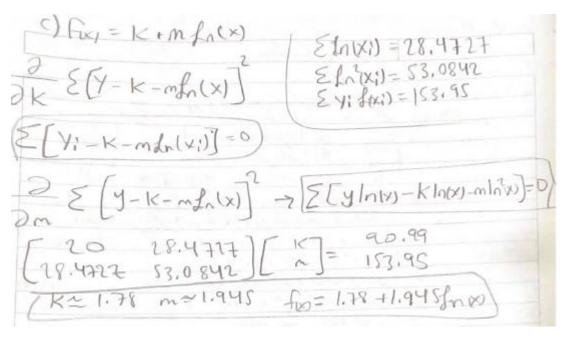
$$\alpha \approx \frac{\log |e_{n+1}/e_n|}{\log |e_n/e_{n-1}|} = \frac{\log |(x_{n+1}-r)/(x_n-r)|}{\log |(x_n-r)/(x_{n-1}-r)|}.$$

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3)







4)d)



