1 "C:\Program Files\Java\jdk-14.0.1\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA
Community Edition 2020.1.1\lib\idea_rt.jar=51253:C:\Program Files\JetBrains\IntelliJ IDEA Community
Edition 2020.1.1\bin" -Dfile.encoding=UTF-8 -classpath C:\Users\ctqdt\IdeaProjects\CS3010_Project_3\
out\production\CS3010_Project_3 com.company.Main

3 4 Equation: $f(x) = 2x^3 - 11.7x^2 + 17.7x - 5$ 5 6 7 Consider true root of this equation to be $x_1 = 0.36509$ 8 *************** 9 10 BISECTION METHOD 11 **************** 12 bп f(a_n) f(b_n) f(c_n) approx e true e 13 0.0000 1.0000 0.5000 -5.0000 3,0000 1.1750 N/A 0.1349 14 0 15 0.0000 0.5000 0.2500 -5.0000 1.1750 -1.2750 1.0000 0.1151 16 0.2500 0.5000 0.3750 -1.2750 1.1750 0.0977 0.3333 0.0099 0.2500 0.2000 0.0526 17 3 0.3750 0.3125 -1.2750 0.0977 -0.5503 4 0.0909 18 0.3125 0.3750 0.3438 -0.5503 0.0977 -0.2169 0.0213 19 5 0.3438 0.3750 0.3594 -0.2169 0.0977 -0.0573 0.0435 0.0057 20 6 0.3594 0.3750 0.3672 -0.0573 0.0977 0.0208 0.0213 0.0021 -0.0573 0.3594 0.0018 21 7 0.3672 0.3633 0.0208 -0.0181 0.0108 22 0.3633 0.3672 0.3652 -0.0181 0.0208 0.0014 0.0053 0.0001 23 24 ******************************** 25 FALSE POSTTION METHOD **************** 26 27 b n f(a n) f(b n) f(c_n) approx e true e n a n c n 28 -----1.0000 -5.0000 1.9805 N/A 0.2599 29 0.0000 3.0000 0.6250 -5.0000 1.9805 0.7585 30 0.0000 0.6250 0.4477 0.3961 0.0826 1 31 0.0000 0.4477 -5.0000 0.7585 0.3887 0.2298 0.1517 0.0236 0.0000 0.3887 -5.0000 0.2298 0.0646 0.0460 0.0065 32 0.3716 -5.0000 33 4 0.0000 0.3716 0.0646 0.3669 0.0178 0.0129 0.0018 0.0036 34 5 0.0000 -5.0000 0.0178 0.3656 0.0049 0.0005 0.3669 35 ***************** 36 37 NEWTON RAPHSON METHOD ************** 38 $x_n f(x_n) f'(x_n)$ 39 $f(x_n+1)$ $f'(x_n+1)$ approx e true e 40 41 0.0000 -5.0000 17.7000 0.2825 -0.8886 11.5686 1.0000 0.0826 0.0058 42 0.2825 -0.8886 11.5686 0.3593 -0.0581 10.0671 0.2138 1 10.0671 43 0.3593 -0.0581 0.3651 -0.0003 9.9571 0.0158 0.0000 44 0.3651 -0.0003 9.9571 0.3651 -0.0000 9.9565 0.0001 0.0000 45 *************** 46 47 SECANT METHOD 48 ***************** 49 f(x_n-1) x_n+1 f(x_n+1) approx e true e 50 ______ -----51 0.0000 -5.0000 1.0000 3.0000 1.9805 0.6000 0.2599 0.6250 52 1.0000 3.0000 0.6250 1.9805 -0.1034 -6.9585 7.0417 0.4685 1.9805 53 2 0.6250 -0.1034 -6.9585 0.4636 0.8904 1.2231 0.0985 54 -0.1034 -6.9585 0.4636 0.8904 0.3993 0.0342 0.3293 0.1611 55 0.4636 0.8904 0.3993 0.3293 0.3615 0.1044 0.0036 -0.0356 -0.0356 0.0101 0.0001 0.3993 0.3652 0.0012 56 0.3293 0.3615 0.0000 57 6 0.3615 -0.0356 0.3652 0.0012 0.3651 0.0003 0.0000 58 *************** 59 MODIFIED SECANT METHOD 60 61 *************** d f(x_n) $d + x_n f(d + x_n)$ x_n+1 62 x_n approx e true e 63 ----1.1750 0.0050 -0.2307 0.0017 64 0.5000 0.5050 1.2123 0.3424 0.4602 0.0227 65 1 0.3424 0.3441 -0.2129 0.3647 0.0610 0.0004 0.0006 -0.0044 0.3653 0.0018 0.3651 0.0012 0.0000 66 2 0.3647 67

File - Main 68 Consider true root of this equation to be x = 1.9217469 70 *************** 71 RISECTION METHOD 72 ********************************** n a_n b_n c n f(a n) $f(b_n)$ $f(c_n)$ approx e true e 73 74 ------1.5000 2.0000 1.7500 1.9750 -0.4000 0.8625 N/A 0.1717 75 0 -0.4000 0.2383 0.0667 0.0467 -0.4000 -0.0806 0.0323 0.0158 1.7500 76 1 2.0000 1.8750 0.8625 77 1.8750 1.9375 0.2383 2.0000 -0.0806 0.0791 0.0164 -0.0806 -0.0007 0.0081 1.8750 1.9063 78 3 1.9375 1.9063 0.2383 0.0155 79 1.9219 4 1.9375 0.0791 0.0001 80 81 ************** FALSE POSITION METHOD 82 83 *************** a_n b_n 84 n f(a_n) f(b_n) f(c_n) approx e c_n true e 85 -----0 1.5000 2.0000 1.9750 -0.4000 1.9158 0.0304 N/A 86 0.0060 87 1 1.9158 2.0000 0.0304 -0.4000 1.9217 0.0000 0.0031 0.0000 88 89 ************** 90 NEWTON RAPHSON METHOD 91 ********** 92 n x_n $f(x_n)$ $f'(x_n)$ x_n+1 $f(x_n+1)$ $f'(x_n+1)$ approx e 93 -----94 0 1.5000 1.9750 -3.9000 2.0064 -0.4327 -5.0959 0.2524 0.0847 1.9215 -5.1101 1 9217 95 1 2.0064 96 2 1.9215

 0.0012
 -5.1101
 0.0442

 -0.0000
 -5.1102
 0.0001

 0.0002 -0.4327 0.0000 0.0012 97 98 ************** 99 SECANT METHOD 100 ******************************** f(x_n-1) 101 n x_n-1 x_n f(x_n+1) f(x n) x n+1 approx e 102 -----103 0 1.5000 1.9750 2.0000 -0.4000 1.9158 0.0304 0.0440 0.0060 2.0000 0.0000 0.0304 1.9217 0.0000 0.0031 104 1 -0.4000 1.9158 105 106 ********************************* MODIFIED SECANT METHOD 107 108 ******************************** 109 n $x_n = f(x_n)$ d $d + x_n = f(d + x_n)$ x_n+1 approx e 110 -----
 111
 0
 1.5000
 1.9750
 0.0150
 1.5150
 1.9159
 2.0013
 0.2505
 0.0795
 2.0013 0.0004 -0.4064 0.0300 2.0313 0.0018 0.0577 1.9791

 -0.5592
 1.9214
 0.0416

 -0.2931
 1.9217
 0.0002

 112 1 113 1.9214 0.0000 114 Consider true root of this equation to be $x_3 = 3.56316$ 115 116 117 ******************************* BISECTION METHOD 119 ***************** c_n 120 n a_n b_n $f(b_n)$ $f(c_n)$ approx e f(a_n) true e 121 -----3.7500 -0.6250 6.6000 2.3125 N/A 3.6250 -0.6250 2.3125 0.6867 0.0345

 0
 3.5000
 4.0000
 3.7500

 1
 3.5000
 3.7500
 3.6250

 122 0.1868 1 0.0618 123 0.6867 3.5000 -0.6250 -0.0069 3.6250 3.5625 0.0175 0.0007 124 0.6867 0.3303 0.0087 3.5625 3.6250 3.5938 -0.0069 0.0306 125 126 127 ******************************* FALSE POSITION METHOD 128 129 *************** n an bn f(an) f(bn)130 c n f(c n) approx e true e 131 -------0.6250 6.6000 -0.2052 6.6000 3.5433 -0.2052 N/A 0.0199 3.5570 -0.0641 0.0039 0.0061 0 3.5000 4.0000 3.5433 132 133 1 3.5433 4.0000

135 ******************

137 *******************************

136 NEWTON RAPHSON METHOD

	v n	f(v n)	f'(v n)	v n±1	f(v n±1)	f'(v n±1)	annrov o	tnuc
8 n 9	x_n 	Γ(X_Π)	f'(x_n)	x_u+1	ı (X_II+1)	f'(x_n+1)	approx e	true
9 0	3.5000	-0.6250	9.3000	3.5672	0.0426	10.5771	0.0188	0.004
1	3.5672	0.0426		3.5632	0.0002	10.4990	0.0011	0.000
****	*******			******				
****	********	SECANT MET	HOD	. ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓				
						£(., n.1)		
	x_n-1	T(X_n-1)	x_n	T(X_n)	x_n+1	f(x_n+1)	approx e	true
7 3 0	3.5000	0 6250	4 0000	6 6000	3.5433	-0.2052	0.1289	0.019
) 1	4.0000	-0.6250 6.6000	3 5/33	-0.2052	3.5570	-0.2632		0.00
) 1	4.0000	0.0000	3.5455	-0.2032	3.3370	-0.0041	0.0055	0.000
	********	******	******	******				
2	MOD	IFIED SECANT	METHOD					
****	********	******	******	******				
1 n	x_n	f(x_n)	d	d + x_n	$f(d + x_n)$	x_n+1	approx e	true
5								
5 0	3.5000	-0.6250			-0.2880	3.5649	0.0182	0.00
' 1	3.5649	0.0184	0.1248	3.6897	1.4874	3.5633	0.0004	0.00
}								
	000000000000000000000000000000000000000					000000000000000000000000000000000000000	000000000000000000000000000000000000000	@@@@@@@
)			tion: $f(x) =$					
	000000000000000000000000000000000000000	@@@@@@@@@@@@	<u></u> @@@@@@@@@@@@@	100000000000000000000000000000000000000	(0)	000000000000000000000000000000000000000	000000000000000000000000000000000000000	(@@@@@@@
2		+ -£ +b:		. ha. 120 C				
	Consider true	root of thi	s equation t	o be: 126.6	32			
4 = ****	********	*******	********	******				
5		BISECTION ME						
) 7 ****	*********	*********	*******	******				
3 n		b_n		f(a_n)		f(c_n)	annrox e	true
)				. (
9 0	123.0000	127.0000	125.0000	-0.3033	0.0297	-0.1340	N/A	1.63
l 1	125.0000	127.0000	126.0000	-0.1340	0.0297	-0.0515		0.63
2								
3 ****	********	******	******	******				
	FA							
5 ****	*******							
6 n	a_n	b_n	f(a_n)	f(b_n)	c_n	f(c_n)	approx e	true
7								
	123.0000	127.0000	-0.3033	0.0297	126.6434	0.0009	N/A 0.0001	0.01
9 1	123.0000	126 6434	-0.3033	a aaaa		a aaaa	a aaa1	0.00
		120.0757	0.3033	0.0009	126.6328	0.0000	0.0001	
)						0.0000	0.0001	
) L ****	*******	******	******			0.0000	0.0001	
0 1 **** 2	NE	**************************************	***********	******		0.0000	0.0001	
0 1 **** 2 3 ****	NE ******	************* WTON RAPHSON ******	********** METHOD ******	******				
) 1 **** 2 3 **** 1 n	NE ******* x_n	**************************************	********** METHOD ******	******			approx e	
0 1 ***** 2 3 **** 4 n	NE ******* x_n	********** WTON RAPHSON ************* f(x_n)	********* METHOD ******** f'(x_n)	********* ******* x_n+1	f(x_n+1)	f'(x_n+1)	approx e	true
0 L ***** 2 3 ***** 1 n 5	NE ******* x_n 123.0000	*********** WTON RAPHSON ******** f(x_n)	********** METHOD ******** f'(x_n) 0.0861	********* ******* X_n+1 	f(x_n+1) 	f'(x_n+1) 0.0812	approx e 0.0279	true 0.10
0 1 ***** 2 3 ***** 4 n 5 6 0 7 1	NE ******* x_n	*********** WTON RAPHSON ******** f(x_n)	********** METHOD ******** f'(x_n) 0.0861	********* ******* X_n+1 	f(x_n+1) 	f'(x_n+1) 0.0812	approx e	true 0.10
7 1 ***** 2 3 ***** 4 n 5 6 0 7 1	NE: ******** x_n 123.0000 126.5242	********** WTON RAPHSON ******** f(x_n)0.3033 -0.0088	********* METHOD ********** f'(x_n) 0.0861 0.0812	********** ********* *_n+1 126.5242 126.6323	f(x_n+1) -0.0088 -0.0000	f'(x_n+1) 0.0812	approx e 0.0279	true 0.10
7	NE: ******* X_n 123.0000 126.5242	********** WTON RAPHSON ********* f(x_n)0.3033 -0.0088 ***************	********* METHOD ******** f'(x_n) 0.0861 0.0812 ***********************************	********** ********* *_n+1 126.5242 126.6323	f(x_n+1) -0.0088 -0.0000	f'(x_n+1) 0.0812	approx e 0.0279	true 0.10
2 ***** 2 3 ***** 4 n 5 6 0 7 1 3 9 ****	NE: ******* X_n 123.0000 126.5242 **********************************	********* WTON RAPHSON ********* f(x_n)0.3033 -0.0088 ***********	********* METHOD ******** f'(x_n) 0.0861 0.0812 ***********************************	********* ***************************	f(x_n+1) 	f'(x_n+1) 0.0812	approx e 0.0279	true 0.10
) L ***** 2 3 ***** 1 n 5 5 0 7 1 3 9 *****	NE: ******* X_n 123.0000 126.5242 **********************************	********** WTON RAPHSON ********* f(x_n)0.3033 -0.0088 ************ SECANT METI ************	******** METHOD ******** f'(x_n) 0.0861 0.0812 ***********************************	**************************************	f(x_n+1) -0.0088 -0.0000	f'(x_n+1) 0.0812 0.0810	approx e 0.0279 0.0009	true 0.10 0.00
3 ***** 2 3 ***** 4	NE: ******** x_n 123.0000 126.5242 ********* x_n-1	********* WTON RAPHSON ******** f(x_n)0.3033 -0.0088 ********* SECANT METI ********** f(x_n-1)	********* METHOD ******** f'(x_n) 0.0861 0.0812 *********** HOD ********************	**************************************	f(x_n+1) -0.0088 -0.0000 x_n+1	f'(x_n+1) 0.0812 0.0810 f(x_n+1)	approx e 0.0279 0.0009 approx e	true 0.10 0.00 true
0	NE: ******** x_n 123.0000 126.5242 ********* x_n-1	********* WTON RAPHSON ******** f(x_n)0.3033 -0.0088 ********* SECANT METI ********** f(x_n-1)	********* METHOD ******** f'(x_n) 0.0861 0.0812 *********** HOD ********************	**************************************	f(x_n+1) -0.0088 -0.0000 x_n+1	f'(x_n+1) 0.0812 0.0810 f(x_n+1)	approx e 0.0279 0.0009 approx e	true 0.10 0.00 true
3 ***** 2 3 ***** 4	NE: ******** x_n 123.0000 126.5242 ********* x_n-1	********* WTON RAPHSON ******** f(x_n)0.3033 -0.0088 ********* SECANT METI ********** f(x_n-1)	********* METHOD ******** f'(x_n) 0.0861 0.0812 *********** HOD ********************	**************************************	f(x_n+1) -0.0088 -0.0000 x_n+1	f'(x_n+1) 0.0812 0.0810 f(x_n+1)	approx e 0.0279 0.0009 approx e	true 0.10 0.00 true
)	NE: ******** X_n 123.0000 126.5242 ******** X_n-1 123.0000 127.0000	********* WTON RAPHSON ******** f(x_n)0.3033 -0.0088 ********* SECANT METI ********* f(x_n-1)0.3033 0.0297	********* METHOD ******** f'(x_n) 0.0861 0.0812 ********** HOD ********** x_n 127.0000 126.6434	************ X_n+1 126.5242 126.6323 ******** f(x_n) 0.0297 0.0009	f(x_n+1) -0.0088 -0.0000 x_n+1 -126.6434 126.6324	f'(x_n+1) 0.0812 0.0810 f(x_n+1)	approx e 0.0279 0.0009	true 0.10 0.00 true
3 ***** 2	NE: ******** x_n 123.0000 126.5242 ********* x_n-1	********* WTON RAPHSON ******** f(x_n)0.3033 -0.0088 ********* SECANT METI ********* f(x_n-1)0.3033 0.0297	********* METHOD ******** f'(x_n) 0.0861 0.0812 ********** HOD ********** x_n 127.0000 126.6434	************ X_n+1 126.5242 126.6323 ******** f(x_n) 0.0297 0.0009	f(x_n+1) -0.0088 -0.0000 x_n+1 -126.6434 126.6324	f'(x_n+1) 0.0812 0.0810 f(x_n+1)	approx e 0.0279 0.0009 approx e	true 0.10 0.00 true
0 1 ***** 2 3 ***** 4 n 5 6 0 7 1 8 9 ***** 0 1 ***** 4 0 5 1 6 7 *****	NE: ******* X_n 123.0000 126.5242 ******** X_n-1 123.0000 127.0000 ********************************	********* WTON RAPHSON ********* f(x_n)0.3033 -0.0088 ********* SECANT METI ********* f(x_n-1)0.3033 0.0297 ************* IFIED SECANT	******** METHOD ******** f'(x_n) 0.0861 0.0812 ********** HOD ********* 127.0000 126.6434 **********************************	************ x_n+1 126.5242 126.6323 ******* f(x_n) 0.0297 0.0009	f(x_n+1) -0.0088 -0.0000 x_n+1 -126.6434 126.6324	f'(x_n+1) 0.0812 0.0810 f(x_n+1)	approx e 0.0279 0.0009 approx e	true 0.10 0.00 true
0	NE ******* X_n 123.0000 126.5242 ******** ******** X_n-1 123.0000 127.0000 ************ MOD *******************	********* WTON RAPHSON ******** f(x_n) 0.3033 -0.0088 ********** SECANT METI ********** f(x_n-1) 0.3033 0.0297 ************ IFIED SECANT ***********************************	******** METHOD ******** f'(x_n) 0.0861 0.0812 ********* HOD ********* 127.0000 126.6434 ************ METHOD ***********************************	*********** x_n+1 126.5242 126.6323 ******** f(x_n) 0.0297 0.0009 *******************************	f(x_n+1) -0.0088 -0.0000 x_n+1	f'(x_n+1) 0.0812 0.0810 f(x_n+1) 0.0009 -0.0000	approx e 0.0279 0.0009 approx e 0.0028 0.0001	true 0.10 0.00 true
0	NE ******* X_n 123.0000 126.5242 ******** ******** X_n-1 123.0000 127.0000 ************ MOD *******************	********* WTON RAPHSON ******** f(x_n) 0.3033 -0.0088 ********** SECANT METI ********** f(x_n-1) 0.3033 0.0297 ************ IFIED SECANT ***********************************	******** METHOD ******** f'(x_n) 0.0861 0.0812 ********* HOD ********* 127.0000 126.6434 ************ METHOD ***********************************	*********** x_n+1 126.5242 126.6323 ******** f(x_n) 0.0297 0.0009 *******************************	f(x_n+1) -0.0088 -0.0000 x_n+1 -126.6434 126.6324	f'(x_n+1) 0.0812 0.0810 f(x_n+1) 0.0009 -0.0000	approx e 0.0279 0.0009 approx e 0.0028 0.0001	true 0.10 0.00 true 0.01 0.00
0	NE********* x_n 123.0000 126.5242 ********* x_n-1 123.0000 127.0000 *********** MOD ************ x_n	********* WTON RAPHSON ********* f(x_n)0.3033 -0.0088 ********** SECANT METI ********* f(x_n-1)0.3033 0.0297 *********** IFIED SECANT ********* f(x_n)	********* METHOD ********* f'(x_n) 0.0861 0.0812 ********** HOD ********* x_n -127.000 126.6434 *********** METHOD ************ d	**************************************	f(x_n+1) -0.0088 -0.0000 x_n+1	f'(x_n+1) 0.0812 0.0810 f(x_n+1) 0.0009 -0.0000	approx e	true 0.10 0.00 true 0.01 0.00
20	NE********* x_n 123.0000 126.5242 ********* x_n-1 123.0000 127.0000 *********** MOD ************ x_n	********* WTON RAPHSON ********* f(x_n)0.3033 -0.0088 ********** SECANT METI ********* f(x_n-1)0.3033 0.0297 *********** IFIED SECANT ********* f(x_n)	********* METHOD ********* f'(x_n) 0.0861 0.0812 ********** HOD ********* x_n -127.000 126.6434 *********** METHOD ************ d	**************************************	f(x_n+1) -0.0088 -0.0000 x_n+1	f'(x_n+1) 0.0812 0.0810 f(x_n+1) 0.0009 -0.0000	approx e	true 0.10 0.00 true 0.01 0.00
0	NE********* x_n 123.0000 126.5242 ********* x_n-1 123.0000 127.0000 *********** MOD ************ x_n	********* WTON RAPHSON ********* f(x_n)0.3033 -0.0088 ********** SECANT METI ********* f(x_n-1)0.3033 0.0297 *********** IFIED SECANT ********* f(x_n)	********* METHOD ********* f'(x_n) 0.0861 0.0812 ********** HOD ********* x_n -127.000 126.6434 *********** METHOD ************ d	**************************************	f(x_n+1) -0.0088 -0.0000 x_n+1	f'(x_n+1) 0.0812 0.0810 f(x_n+1) 0.0009 -0.0000	approx e	true 0.10 0.00 true 0.01 0.00

205 Process finished with exit code 0 206 $\,$