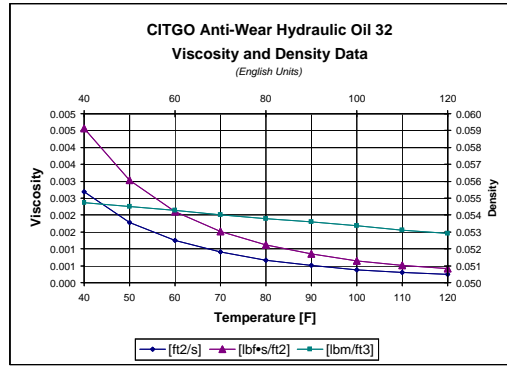
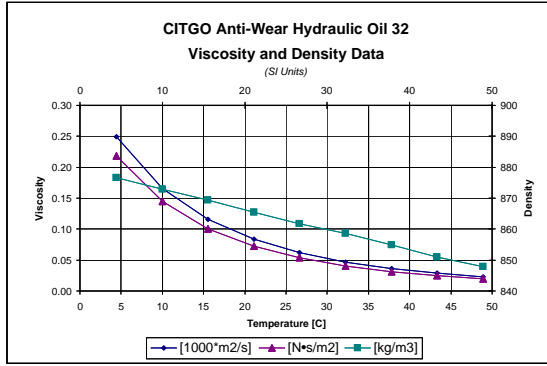


CITGO Anti-Wear Hydraulic Oil Grade 32

Temperature		Viscosity						Density			
[F]	[C]	Kinematic			Dynamic			[lb./ft. ³]	[kg/m ³]		
		[cSt]	[m ² /s]	[1000·m ² /s]	[ft ² /s]	[CP]	[N·s/m ²]	[lb. _m ·s/ft ²]	[gm/mL]		
40	4.44	249	2.49E-04	2.49E-01	2.68E-03	218.30	2.18E-01	4.56E-03	0.054731	0.8767	876.7
50	10.00	166	1.66E-04	1.66E-01	1.79E-03	144.90	1.45E-01	3.03E-03	0.054493	0.8729	872.9
60	15.56	116	1.16E-04	1.16E-01	1.25E-03	100.84	1.01E-01	2.11E-03	0.054269	0.8693	869.3
70	21.11	84	8.40E-05	8.40E-02	9.04E-04	72.69	7.27E-02	1.52E-03	0.054025	0.8654	865.4
80	26.67	62	6.20E-05	6.20E-02	6.67E-04	53.43	5.34E-02	1.12E-03	0.053800	0.8618	861.8
90	32.22	47	4.70E-05	4.70E-02	5.06E-04	40.35	4.04E-02	8.43E-04	0.053601	0.8586	858.6
100	37.78	36	3.60E-05	3.60E-02	3.88E-04	30.78	3.08E-02	6.43E-04	0.053376	0.855	855.0
110	43.33	29	2.90E-05	2.90E-02	3.12E-04	24.68	2.47E-02	5.15E-04	0.053120	0.8509	850.9
120	48.89	23	2.30E-05	2.30E-02	2.48E-04	19.50	1.95E-02	4.07E-04	0.052926	0.8478	847.8



Temperature		Kinematic Viscosity				Dynamic Viscosity				Density			
[F]	[C]	DATA		MODEL		DATA		MODEL		DATA		MODEL	
		[cSt]	[m ² /s]	[m ² /s]	[N·s/m ²]	[N·s/m ²]	[gm/mL]	[kg/m ³]	[kg/m ³]	[gm/mL]	[kg/m ³]	[kg/m ³]	[kg/m ³]
40	4.44	249	2.49E-04	2.49E-04	2.18E-01	2.03E-01	0.8767	876.7	876.4	0.8767	876.7	876.4	876.4
50	10.00	166	1.66E-04	1.66E-04	1.45E-01	1.44E-01	0.8729	872.9	872.8	0.8729	872.9	872.8	872.8
60	15.56	116	1.16E-04	1.16E-04	1.01E-01	1.04E-01	0.8693	869.3	869.2	0.8693	869.3	869.2	869.2
70	21.11	84	8.40E-05	8.40E-05	7.27E-02	7.57E-02	0.8654	865.4	865.6	0.8654	865.4	865.6	865.6
80	26.67	62	6.20E-05	6.20E-05	5.34E-02	5.59E-02	0.8618	861.8	862.0	0.8618	861.8	862.0	862.0
90	32.22	47	4.70E-05	4.70E-05	4.04E-02	4.17E-02	0.8586	858.6	858.4	0.8586	858.6	858.4	858.4
100	37.78	36	3.60E-05	3.60E-05	3.08E-02	3.14E-02	0.855	855.0	854.8	0.855	855.0	854.8	854.8
110	43.33	29	2.90E-05	2.90E-05	2.47E-02	2.39E-02	0.8509	850.9	851.2	0.8509	850.9	851.2	851.2
120	48.89	23	2.30E-05	2.30E-05	1.95E-02	1.84E-02	0.8478	847.8	847.6	0.8478	847.8	847.6	847.6

Dynamic Viscosity Model $\mu = A \cdot e^{(B/T)}$

A = 5.68E-09 1.24E-08 2.6E-09
 B = 4827.627 5061.357 4593.897

DATA		MODEL						
[C]	[K]	1/[K]	[N·s/m ²]	LN(N·s/m ²)	Value	Error	UB 95%	LB 95%
4.44	277.59	0.0036	0.218	-1.52	0.203	-0.016	1.029	0.040
10.00	283.15	0.0035	0.145	-1.93	0.144	-0.001	0.720	0.029
15.56	288.71	0.0035	0.101	-2.29	0.104	0.003	0.510	0.021
21.11	294.26	0.0034	0.073	-2.62	0.076	0.003	0.366	0.016
26.67	299.82	0.0033	0.053	-2.93	0.056	0.002	0.266	0.012
32.22	305.37	0.0033	0.040	-3.21	0.042	0.001	0.196	0.009
37.78	310.93	0.0032	0.031	-3.48	0.031	0.001	0.146	0.007
43.33	316.48	0.0032	0.025	-3.70	0.024	-0.001	0.109	0.005
48.89	322.04	0.0031	0.019	-3.94	0.018	-0.001	0.083	0.004

RMSE = 0.01

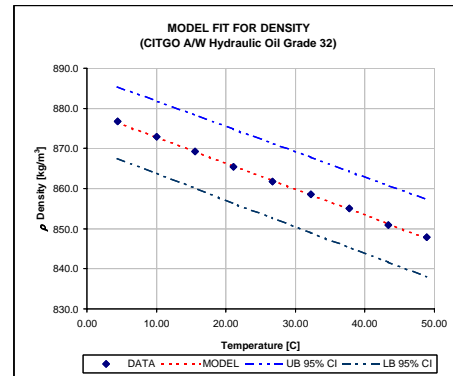
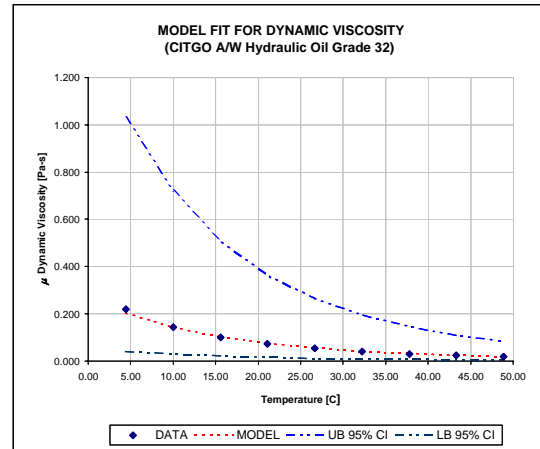
Density Model $\rho = B + AT$

A = -0.647357 -0.63195 -0.66276
 B = 1056.0992 1060.764 1051.434

DATA		MODEL					
[C]	[K]	[gm/mL]	[kg/m ³]	Value	Error	UB 95%	LB 95%
4.44	277.59	0.8767	876.7	876.396	-0.304	885.337	867.455
10.00	283.15	0.8729	872.9	872.800	-0.100	881.827	865.773
15.56	288.71	0.8693	869.3	869.204	-0.096	878.316	860.091
21.11	294.26	0.8654	865.4	865.607	0.207	874.805	856.409
26.67	299.82	0.8618	861.8	862.011	0.211	871.294	852.727
32.22	305.37	0.8586	858.6	858.414	-0.186	867.783	849.405
37.78	310.93	0.8550	855.0	854.818	-0.182	864.272	845.363
43.33	316.48	0.8509	850.9	851.221	0.321	860.761	841.681
48.89	322.04	0.8478	847.8	847.625	-0.175	857.251	837.999

RMSE = 0.21

- NOTES:
- Temperature in the models is absolute (i.e. Kelvin)
 - Model for the kinematic viscosity is based on the ratio of dynamic viscosity over density



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.998535969
R Square	0.997074081
Adjusted R Square	0.996656092
Standard Error	0.047554576
Observations	9

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	5.394457474	5.394457474	2385.410639	3.94771E-10
Residual	7	0.015830064	0.002261438		
Total	8	5.410287537			

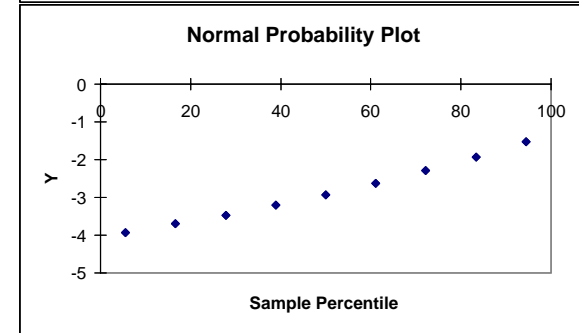
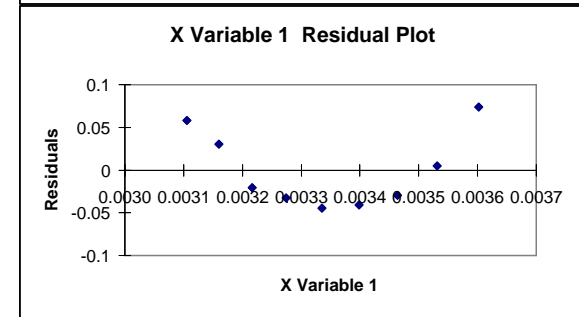
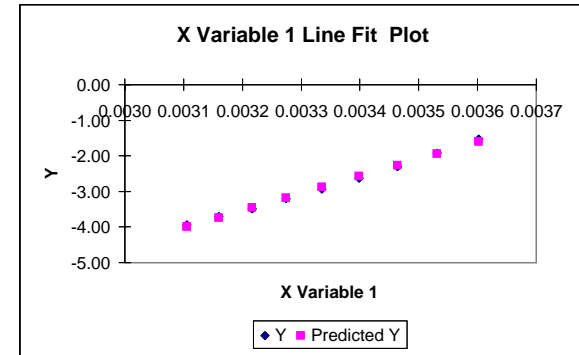
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-18.9865958	0.330820562	-57.39242962	1.27916E-10	-19.76886156	-18.20433003	-19.76886156	-18.20433003
X Variable 1	4827.626907	98.84441223	48.84066584	3.94771E-10	4593.89718	5061.356634	4593.89718	5061.356634

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals	Standard Residuals
1	-1.595660911	0.073768108	1.658335164
2	-1.936880424	0.005178656	0.116418153
3	-2.264967775	-0.029264302	-0.657872654
4	-2.580666757	-0.040835174	-0.917990258
5	-2.884666035	-0.044686912	-1.004578803
6	-3.177604158	-0.032455643	-0.729615209
7	-3.460074035	-0.020816115	-0.467954201
8	-3.732626948	0.030706832	0.690301284
9	-3.995776133	0.05840455	1.312956524

PROBABILITY OUTPUT

Percentile	Y
5.55555556	-3.937371583
16.66666667	-3.701920115
27.77777778	-3.480890151
38.88888889	-3.2100598
50	-2.929352948
61.11111111	-2.621501931
72.22222222	-2.294232077
83.33333333	-1.931701768
94.44444444	-1.521892803



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.999716439
R Square	0.999432959
Adjusted R Square	0.999338452
Standard Error	0.226647408
Observations	8

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	543.2405357	543.2405357	10575.25029	5.69882E-11
Residual	6	0.308214286	0.051369048		
Total	7	543.54875			

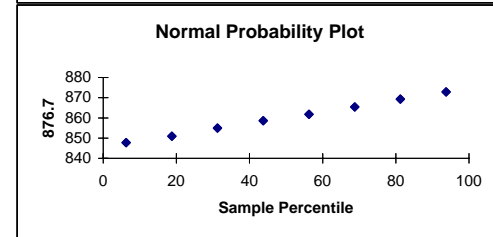
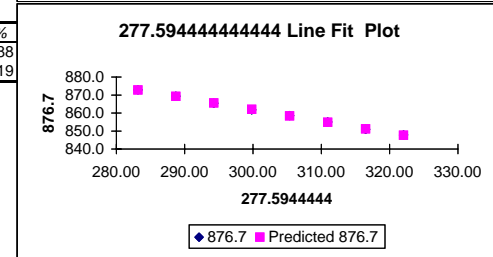
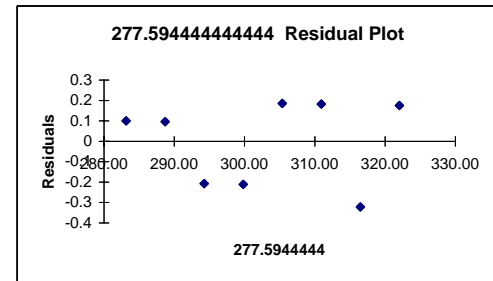
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1056.099175	1.906529399	553.9380487	2.33622E-15	1051.434062	1060.764288	1051.434062	1060.764288
X	-0.647357143	0.006295042	-102.8360359	5.69882E-11	-0.662760566	-0.631953719	-0.662760566	-0.631953719

RESIDUAL OUTPUT

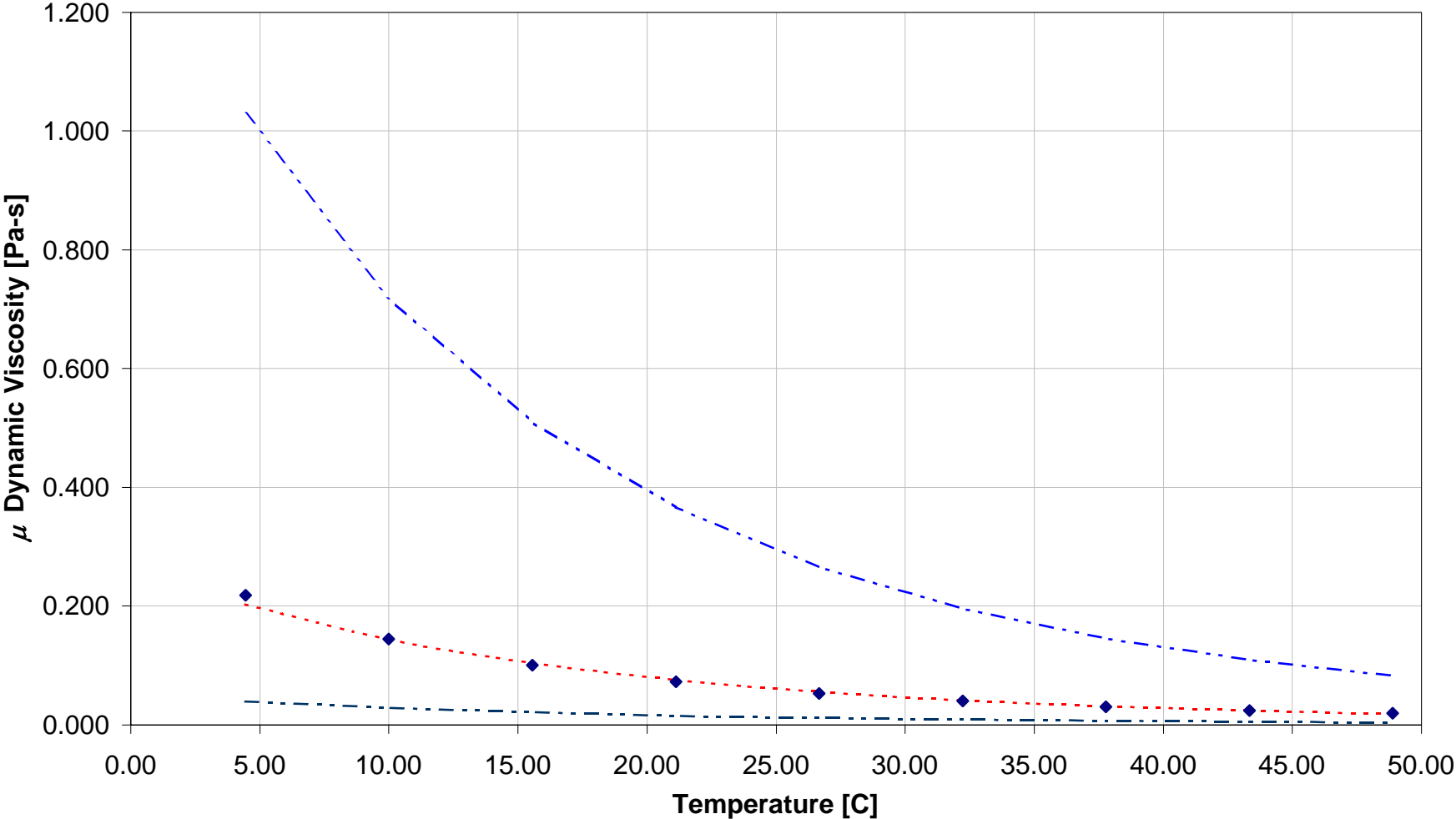
Observation	Predicted 876.7	Residuals	Standard Residuals
1	872.8	0.1	0.476565542
2	869.2035714	0.096428571	0.459545344
3	865.6071429	-0.207142857	-0.98717148
4	862.0107143	-0.210714286	-1.004191678
5	858.4142857	0.185714286	0.885050293
6	854.8178571	0.182142857	0.868030095
7	851.2214286	-0.321428571	-1.531817815
8	847.625	0.175	0.833989699

PROBABILITY OUTPUT

Percentile	876.7
6.25	847.8
18.75	850.9
31.25	855
43.75	858.6
56.25	861.8
68.75	865.4
81.25	869.3
93.75	872.9



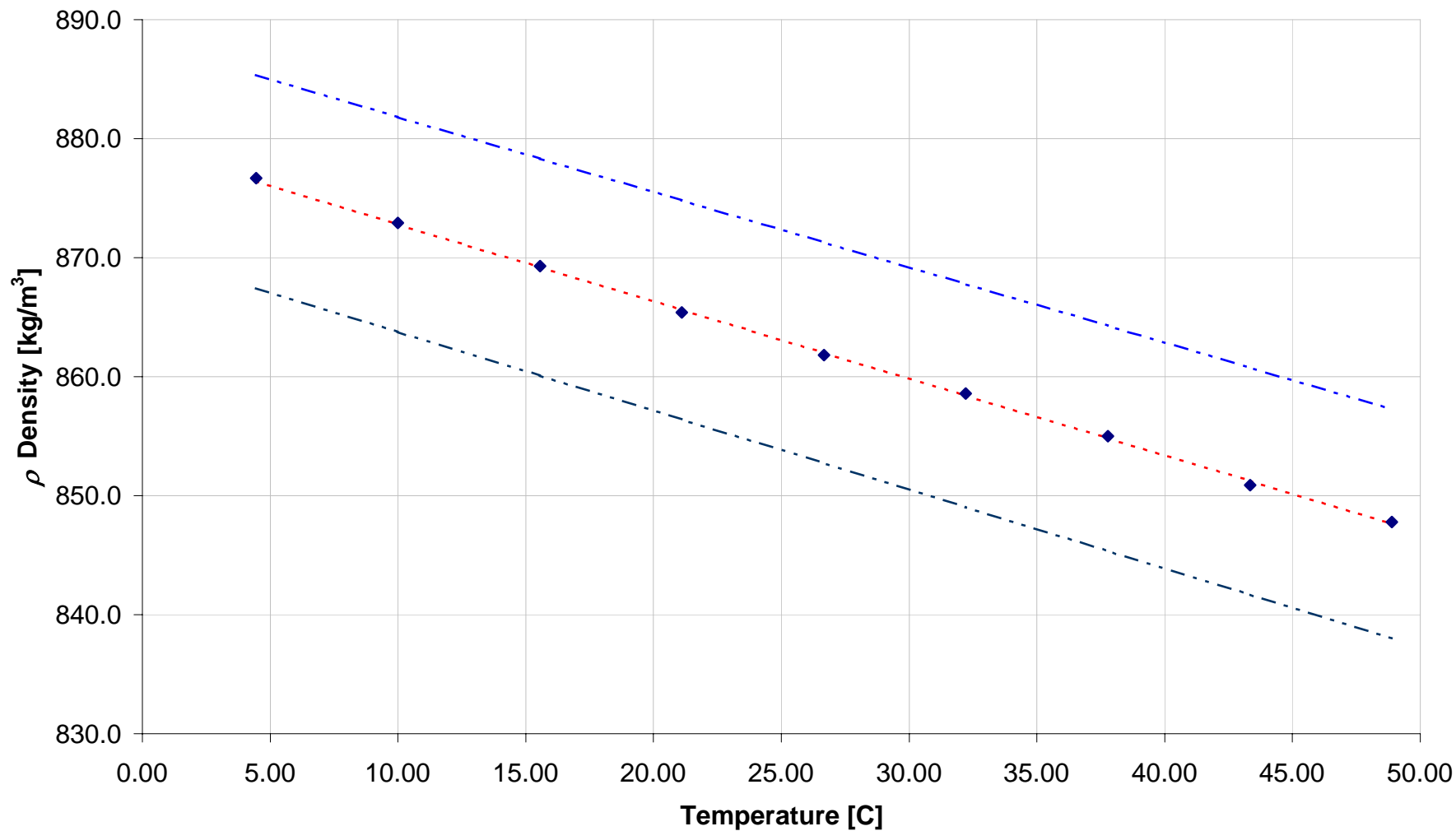
MODEL FIT FOR DYNAMIC VISCOSITY (CITGO A/W Hydraulic Oil Grade 32)



◆ DATA - - - MODEL - . - . UB 95% CI - - - LB 95% CI

MODEL FIT FOR DENSITY

(CITGO A/W Hydraulic Oil Grade 32)



◆ DATA - - - - MODEL - - - - UB 95% CI - - - - LB 95% CI