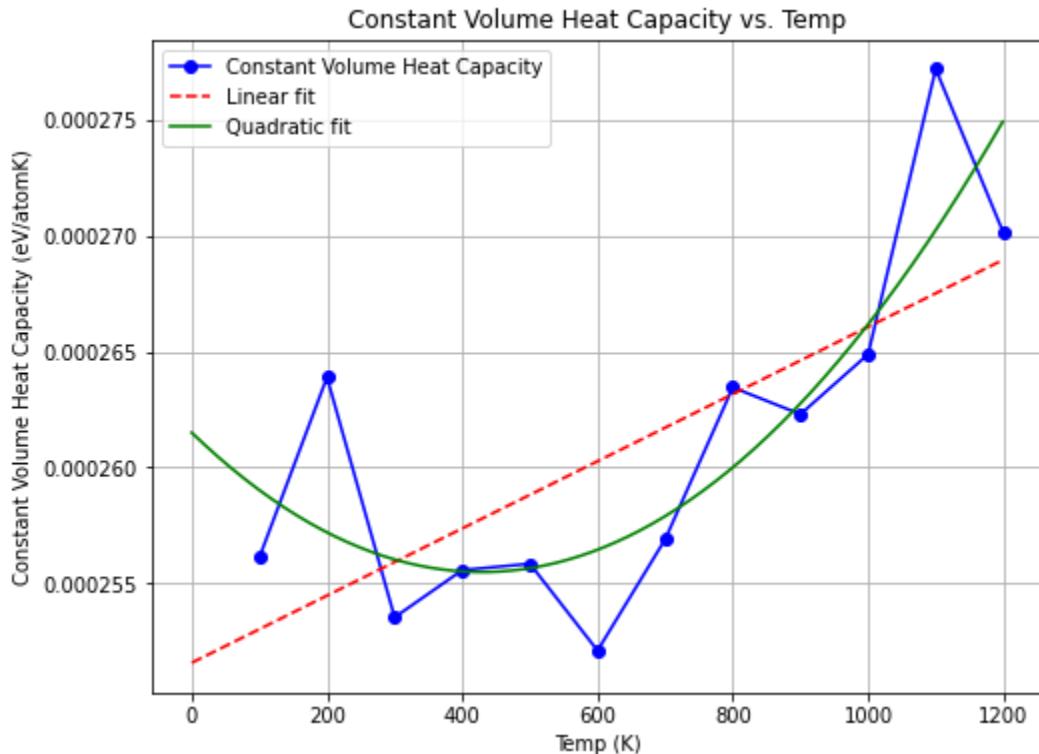


Chase Katz  
 MSEN 470  
 HW3

Part 2:

A. Constant Volume Heat Capacity (eV/atomK)



```
|Temp: 100 |Cv: 0.00025611619731246435 (eV/atomK)|Error:+- 10.28283259155932 |
|Temp: 200 |Cv: 0.0002638919526441217 (eV/atomK)|Error:+- 5.178978077004296 |
|Temp: 300 |Cv: 0.0002535306990334324 (eV/atomK)|Error:+- 3.3580679332847385 |
|Temp: 400 |Cv: 0.00025556922614168923 (eV/atomK)|Error:+- 2.5089958554621377 |
|Temp: 500 |Cv: 0.0002558430941630303 (eV/atomK)|Error:+- 1.9924889215318515 |
|Temp: 600 |Cv: 0.0002520957345483302 (eV/atomK)|Error:+- 1.6350628853777267 |
|Temp: 700 |Cv: 0.00025689828577841773 (eV/atomK)|Error:+- 1.4033988823614663 |
|Temp: 800 |Cv: 0.00026345412340525405 (eV/atomK)|Error:+- 1.2334226562250892 |
|Temp: 900 |Cv: 0.0002622965260403477 (eV/atomK)|Error:+- 1.0849308212230213 |
|Temp: 1000 |Cv: 0.0002648848978285575 (eV/atomK)|Error:+- 0.9729746320055541 |
|Temp: 1100 |Cv: 0.0002771980476257122 (eV/atomK)|Error:+- 0.8971734354554268 |
|Temp: 1200 |Cv: 0.0002701333038263606 (eV/atomK)|Error:+- 0.804774626875739 |
```

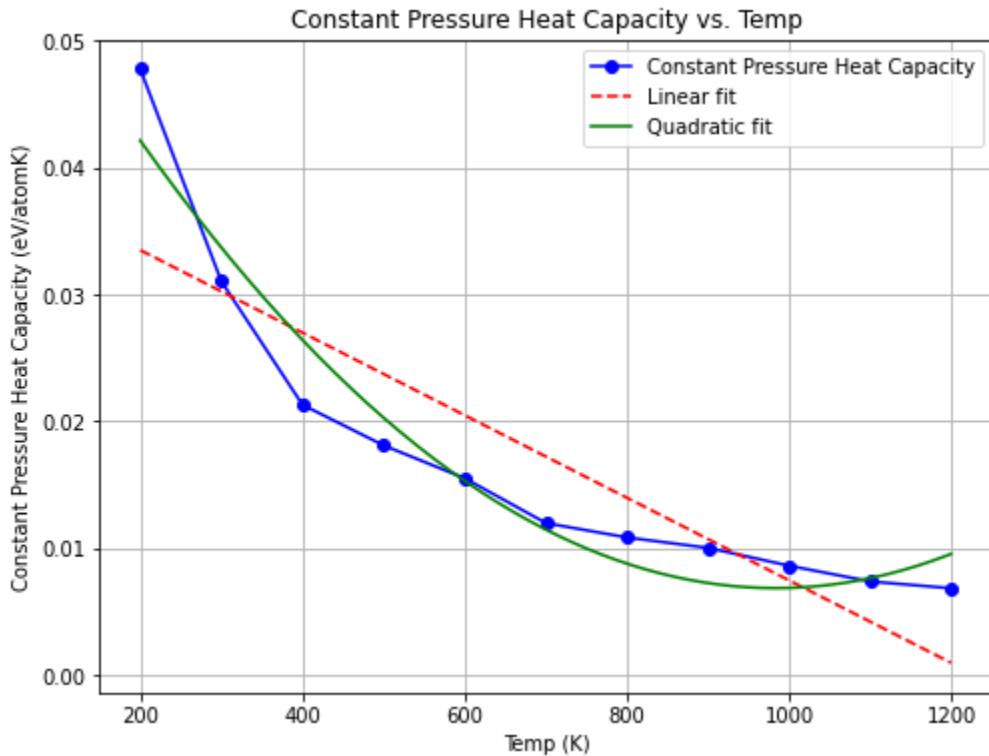
R^2 value for linear fit: 0.5006429006148039

R^2 value for quadratic fit: 0.7326079480348624

The linear line of regression is  $y = 1.4499809667940759 \times 10^{-8} x + 0.00025156779774481493$

The quadratic line of regression is  $y = 3.274876019560859 \times 10^{-11} x^2 + -2.8073578586350407 \times 10^{-8} x + 0.0002615015883374829$

## Constant Pressure Heat Capacity (eV/atomK)



```

|Temp: 200 |Cp: 0.04772755438234872 (eV/atomK)|Error:+- 69.64212674884422 |
|Temp: 300 |Cp: 0.031022395899218277 (eV/atomK)|Error:+- 37.137736768190074 |
|Temp: 400 |Cp: 0.021305594559050508 (eV/atomK)|Error:+- 22.897313860550973 |
|Temp: 500 |Cp: 0.01811411119980978 (eV/atomK)|Error:+- 16.75184413768807 |
|Temp: 600 |Cp: 0.015523390685175156 (eV/atomK)|Error:+- 12.814127564141028 |
|Temp: 700 |Cp: 0.012001341884144439 (eV/atomK)|Error:+- 9.574199881113033 |
|Temp: 800 |Cp: 0.010869522127412917 (eV/atomK)|Error:+- 7.901380687345908 |
|Temp: 900 |Cp: 0.010050149446884352 (eV/atomK)|Error:+- 6.690692962590113 |
|Temp: 1000 |Cp: 0.008641041514654835 (eV/atomK)|Error:+- 5.529613664100183 |
|Temp: 1100 |Cp: 0.007406757852033958 (eV/atomK)|Error:+- 4.6063968402838 |
|Temp: 1200 |Cp: 0.006872184997847586 (eV/atomK)|Error:+- 4.022604246622933 |

```

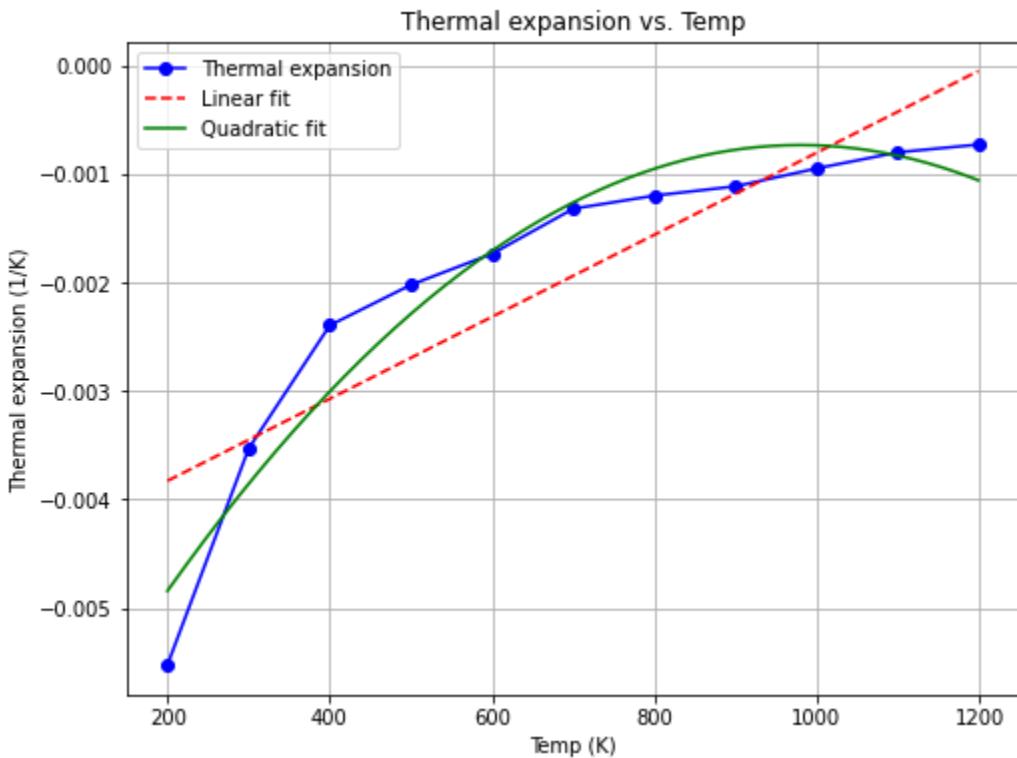
R^2 value for linear fit: 0.7557385681185709

R^2 value for quadratic fit: 0.9400446877469456

The linear line of regression is  $y = -3.25013500280039e-05 x + 0.039981312705837324$

The quadratic line of regression is  $y = 5.7469601293921584e-08 x^2 + -0.0001129587918394941 x + 0.06239445721046674$

## B. Thermal expansion (1/K)



Temp: 200	Thermal expansion: -0.00552246002889267 (1/K)	Error:+- 872087.9962705079
Temp: 300	Thermal expansion: -0.0035309449480063343 (1/K)	Error:+- 468802.4866607778
Temp: 400	Thermal expansion: -0.002395931472194822 (1/K)	Error:+- 291976.7278886091
Temp: 500	Thermal expansion: -0.002022317538513105 (1/K)	Error:+- 216109.5147929965
Temp: 600	Thermal expansion: -0.0017366210332990047 (1/K)	Error:+- 167574.37963805997
Temp: 700	Thermal expansion: -0.0013215273601645523 (1/K)	Error:+- 126899.7202427601
Temp: 800	Thermal expansion: -0.0012009044194084214 (1/K)	Error:+- 106378.36244287314
Temp: 900	Thermal expansion: -0.001115019900291749 (1/K)	Error:+- 91640.21000162042
Temp: 1000	Thermal expansion: -0.0009498996650196403 (1/K)	Error:+- 77116.2204517394
Temp: 1100	Thermal expansion: -0.0008019766423969359 (1/K)	Error:+- 65525.150146075146
Temp: 1200	Thermal expansion: -0.0007300288338824404 (1/K)	Error:+- 58560.650599480985

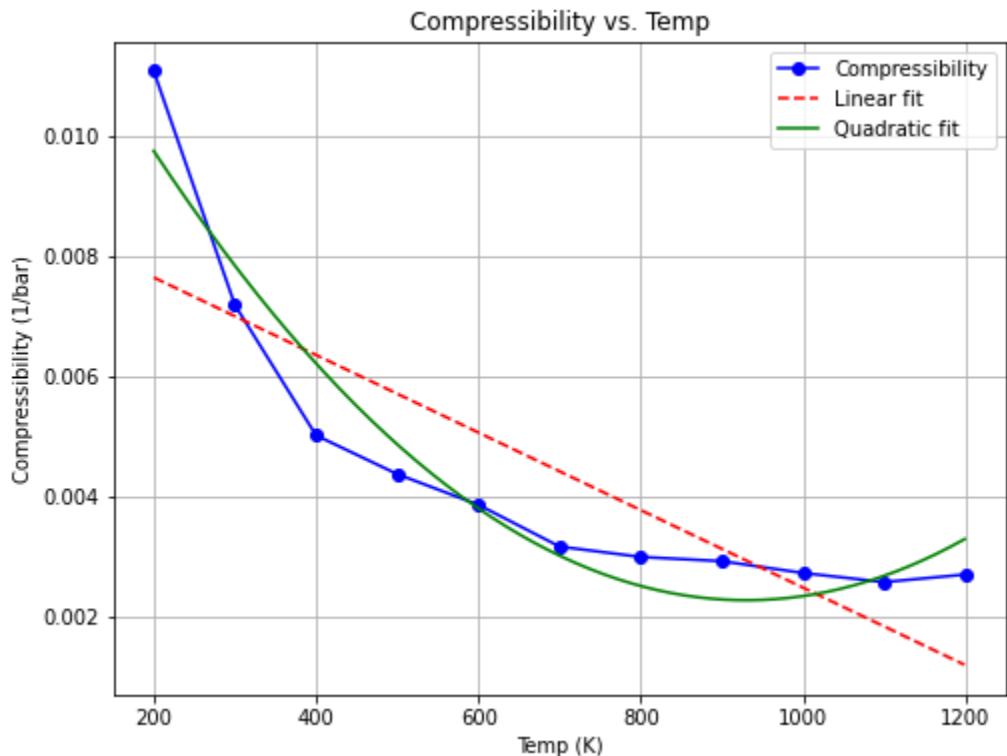
R^2 value for linear fit: 0.7490249192925118

R^2 value for quadratic fit: 0.9357500883518716

The linear line of regression is  $y = 3.7787669553952343e-06 x + -0.004584012490782998$

The quadratic line of regression is  $y = -6.755478326106085e-09 x^2 + 1.3236436611943751e-05 x + -0.00721864903796437$

### C. Compressibility (1/bar)



```

|Temp: 200 |Compressibility: 0.01107400652924106 (1/bar)|Error:+- 2773214.22067691 |
|Temp: 300 |Compressibility: 0.0071815148137489866 (1/bar)|Error:+- 1498384.8430972241 |
|Temp: 400 |Compressibility: 0.005012306200937404 (1/bar)|Error:+- 945528.1736741138 |
|Temp: 500 |Compressibility: 0.004367053021888851 (1/bar)|Error:+- 711492.9437488181 |
|Temp: 600 |Compressibility: 0.0038572802196532884 (1/bar)|Error:+- 561863.6305540322 |
|Temp: 700 |Compressibility: 0.0031615910362902976 (1/bar)|Error:+- 439874.74581372767 |
|Temp: 800 |Compressibility: 0.002988545539102405 (1/bar)|Error:+- 377795.4597471518 |
|Temp: 900 |Compressibility: 0.0029185778033238526 (1/bar)|Error:+- 335311.3040995306 |
|Temp: 1000 |Compressibility: 0.0027214717459935777 (1/bar)|Error:+- 294702.54954085057 |
|Temp: 1100 |Compressibility: 0.0025703841448172947 (1/bar)|Error:+- 263639.40734374267 |
|Temp: 1200 |Compressibility: 0.002696529390900206 (1/bar)|Error:+- 251109.9070468332 |

```

R^2 value for linear fit: 0.675997848997845

R^2 value for quadratic fit: 0.925403445195466

The linear line of regression is  $y = -6.451826986358485e-06 x +$

$0.00892984802189614$

The quadratic line of regression is  $y = 1.4031879657762814e-08 x^2 +$

$-2.609645850722642e-05 x + 0.014402281088423634$