HA2T – Mrs. Nash
4.6 Worksheet

Name: Key

1. The viscosity or stickiness of normal motor oil you use in your car decreases as its temperature increases. The "all weather" motor oils, however, retain a relatively constant viscosity throughout their range of operating temperatures. Suppose that a chemical lab has found the following viscosities for an all weather motor oil:

Temperature in °F	Viscosity
100	54
200	50
300	52
400	54

Let V be the number of units of viscosity and T be the number of **hundreds** of degrees (T=1 means temperature is 100°). Assume that a cubic function is a reasonable model of how V varies with T.

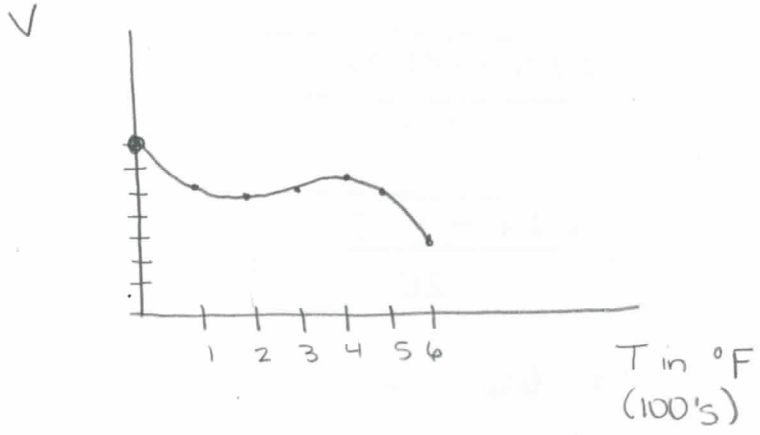
a. Find the particular equation expressing V in terms of T.

$y = -x^3 + 9x^2 - 24x + 70$

b. Predict the viscosity at 0°, 500°, 600°

$x = 0 \quad y = 70$
$x = 5 \quad y = 50$
$x = 6 \quad y = 34$

c. Plot a graph of V versus T in the domain $0 \le T \le 6$



d. Does V=0 for any value of T in this domain? Justify your answer.

$0 = -x^3 + 9x^2 - 24x + 70$

yes, at T=700°F
used graph and table

2. Woody Forester has the job of figuring out how much lumber can be obtained from various sizes of monkeypuzzle trees. From sawmill records he finds that the following numbers of board-feet of lumber can be cut from trees of the given diameters:

Diameter (feet)	Lumber (board-feet)
1	10
2	99
3	324
4	745

He figures that since the board-feet is a cubic measure, a cubic function would be a reasonable mathematical model.

a. Find the particular equation expressing board-feet in terms of diameter.

$y = 10x^3 + 8x^2 - 5x - 3$

b. How much lumber can be obtained from a tree with a trunk five feet in diameter?

$y = 10(5)^3 + 8(5)^2 - 5(5) - 3$

$= 1422$ board-feet

c. Woody finds that the function in part a has one integer zero. What is the zero? Find all other zeros.

The zero is -1

$-1 \mid 10 \quad 8 \quad -5 \quad -3$

$\downarrow \quad -10 \quad 2 \quad 3$

$10 \quad -2 \quad -3 \quad 0$

$(x+1)(10x^2 - 2x - 3)$

$$\frac{2 \pm \sqrt{4 - 4(10)(-3)}}{20}$$

$$= \frac{2 \pm \sqrt{4 + 120}}{20}$$

$= .66, -.46$

d. What is the smallest diameter tree that will produce usable lumber?

$0 = 10x^3 + 8x^2 - 5x - 3$

use calculator and/or part c

$x = .66$ ft

or

7.88 in

tree must be 8" in diameter