

Derina / 558-7209

Math 1050 - Project 1 - Transformations and Piece-wise Functions

Names: Audra Thomson

Derina Conway

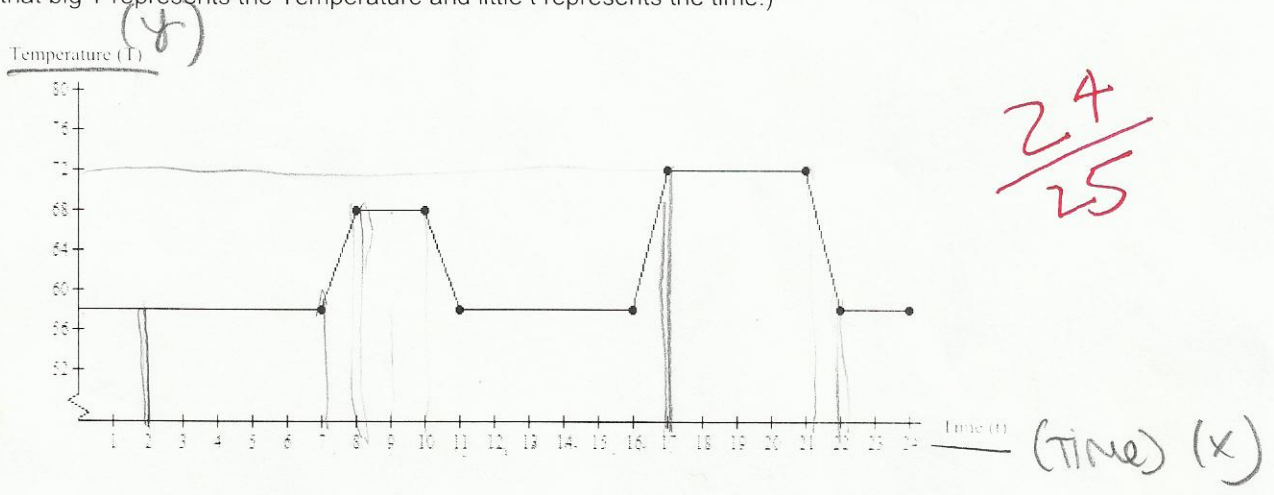
Due date: 2/14/12

The purpose of this project is to understand the uses of simple function transformations and piece-wise functions.

Part I- Using Transformations to Monitor Energy Efficiency:

Heating the house is about 40% of your energy bill. You can cut down on the cost of heating your house in the winter by making many home improvements. One of the easier improvements would be to install a programmable thermostat. (<http://www.uniongas.com/residential/energyconservation/energysavings/thermostat.asp>)

The graph below shows the temperature  $T$  of a home where  $t$  is the time measured in hours after midnight. (Please note that big  $T$  represents the Temperature and little  $t$  represents the time.)

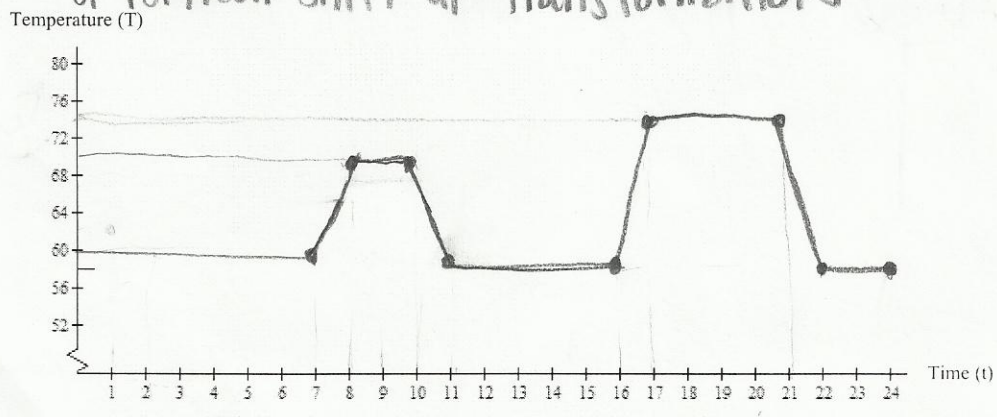


1. What is the temperature at 9 am? 68°F
2. What is the temperature at 5 pm? 72°F
3. What is the temperature at 2 am? approximately 58°F
4. The homeowner reprograms the temperature to  $y = T(t) + 2$ . How does this change the house temperature?

It shifts the graph up 2 on the y-axis increasing the temp by 2.

5. Graph  $y = T(t) + 2$  below. What type of transformation is this?

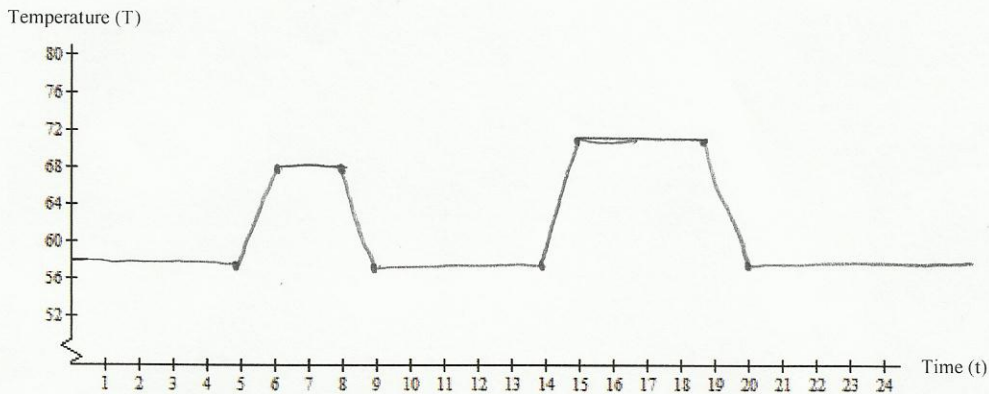
a vertical shift up transformation



6. Using the new graph, what is the temperature at 9 am?  $70^{\circ}$
7. Using the new graph, what is the temperature at 5 pm?  $94^{\circ}$
8. Using the new graph, what is the temperature at 2 am?  $60^{\circ}$
9. The homeowner reprograms the temperature to  $h = T(t+2)$ . How does this change the house temperature?  
*instructs thermostat to raise temp 2 hours earlier*

10. Graph  $h = T(t+2)$  below. What type of transformation is this?

*Shifts left 2 points*



*58  
5, 9, 14, 20*

*68  
6+8*

*72  
15+19*

11. What is the temperature at 9 am?  $58^{\circ}$
12. What is the temperature at 5 pm?  $72^{\circ}$
13. What is the temperature at 2 am?  $58^{\circ}$
14. Give a reason for why a homeowner might want to reprogram the temperature as they did in 9-13.

*perhaps they want to start getting up 2 hours earlier so they can get their work done early, before the day gets too hot*

Part II- Using a Piecewise-Defined Function to Model Vacation Time:

A certain company awards paid vacation time to their employees according to the following criteria:

- Employees who have worked for the company for less than 6 months receive no paid vacation time.
- Employees who have worked for the company for at least 6 months but less than 2 years receive 10 days of paid vacation time each year.
- Employees who have worked for the company for at least 2 years but less than 5 years receive 15 days of paid vacation time each year.
- Employees who have worked for the company for at least 5 receive 20 days of paid vacation time each year.

15. Write a piecewise defined function that represents the number of paid vacation days as a function of the number of years an employee has worked for the company. (You can choose the variables you want to use, but it's always nice to choose letters that remind you of what each variable represents...that's why we use "t" to represent time.) Be sure to indicate what each variable you choose represents.

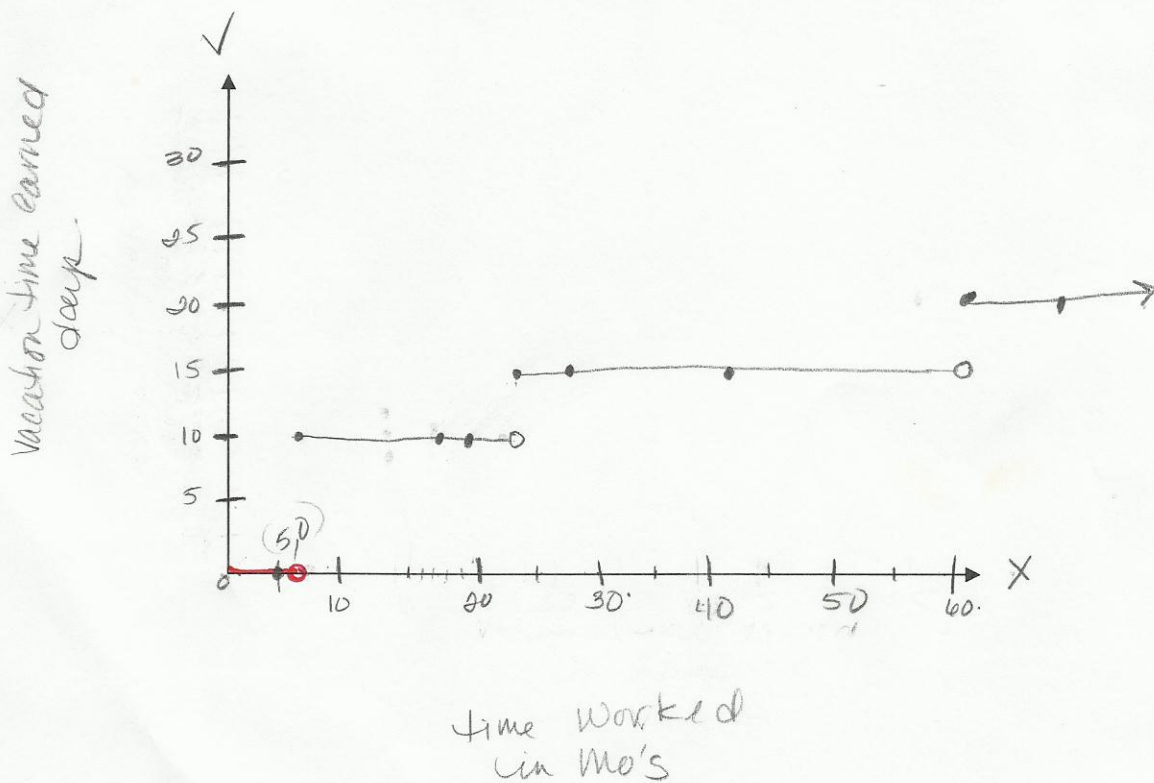
$x = \text{time worked in mos}$

$v = \text{Vacation time earned}$

$$f(x) \begin{cases} \text{if } x < 6 & \text{then } v = 0 \\ \text{if } 6 \leq x < 24 & \text{then } v = 10 \\ \text{if } 24 \leq x < 60 & \text{then } v = 15 \\ \text{if } 60 \leq x < \infty & \text{then } v = 20 \end{cases}$$

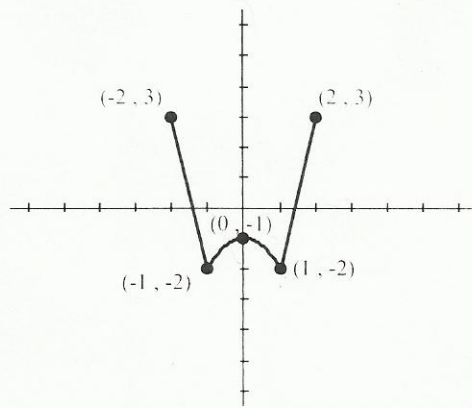
x	v
0	0
5	0

16. Graph your function. Be sure to include the correct scale and labels on each axis.



x	v
18	10
30	10
25	15
30	15
45	15
60	20
68	20
24	10

Part III. Let the graph of some function  $F(x)$  be given as follows:



Based on the graph of  $F(x)$ , graph the following. Label the x and y-coordinates of the points corresponding to the labeled points of  $F(x)$ .

