4.5 Cubic Functions   Name_____

Transformations with cubic functions:

1. Let *H(c)=* be the volume in kiloliters of hot chocolate sold weekly by Starbecks when the price is *c* cents.

	Situation	Function Notation (Alter the original function notation to reflect the changes in the situation.)	Graph (Describe how the appearance of the graph would compare to a graph of Starbecks original situation. Use words like shift or stretch and be as specific as possible.)	Equation (Based on the function notation, write an equation.)
	Starbecks **original** situation.	*H(c)*	*Same as original*	$H(c) = \dfrac{\pi}{3}c^3$
A	There was a flood in West Africa so the price of chocolate increased so Starbecks needed to charge 3 cents more than usual.			
B	Starbecks wanted to make more money selling hot chocolate so they charged 3 times as much. The same day, the temperature dropped 20 degrees so Starbecks sold 3 times as much hot chocolate.			
C	Starbecks gave away a free donut to first 30 customers so they sold 3 more kiloliters of hot chocolate than usual.			

2. Graph the **Original Situation** and **Situation C** using a table.

Original

$H(c) = \dfrac{\pi}{3}c^3$

x	f(x)

Situation C

x	f(x)

**a.** Describe how the appearance of the graph in **Situation C** compares to the graph of Starbecks **Original Situation**.

Hint: (Use words like shift or stretch and be as specific as possible.)

3. To save money, a family uses a setback thermostat that keeps the house at a lower temperature after the family goes to bed and during the day when they are at work and school. The heat goes up in the morning at 4:00 am so the house is toasty warm when the family gets up, it goes back down after they leave at 8:00 am.

a. On the coordinate axes below, sketch a reasonable graph to show the temperature, *H*, in degrees, as a function of time, *t* in hours after midnight. Be able to explain all of the features of your graph.
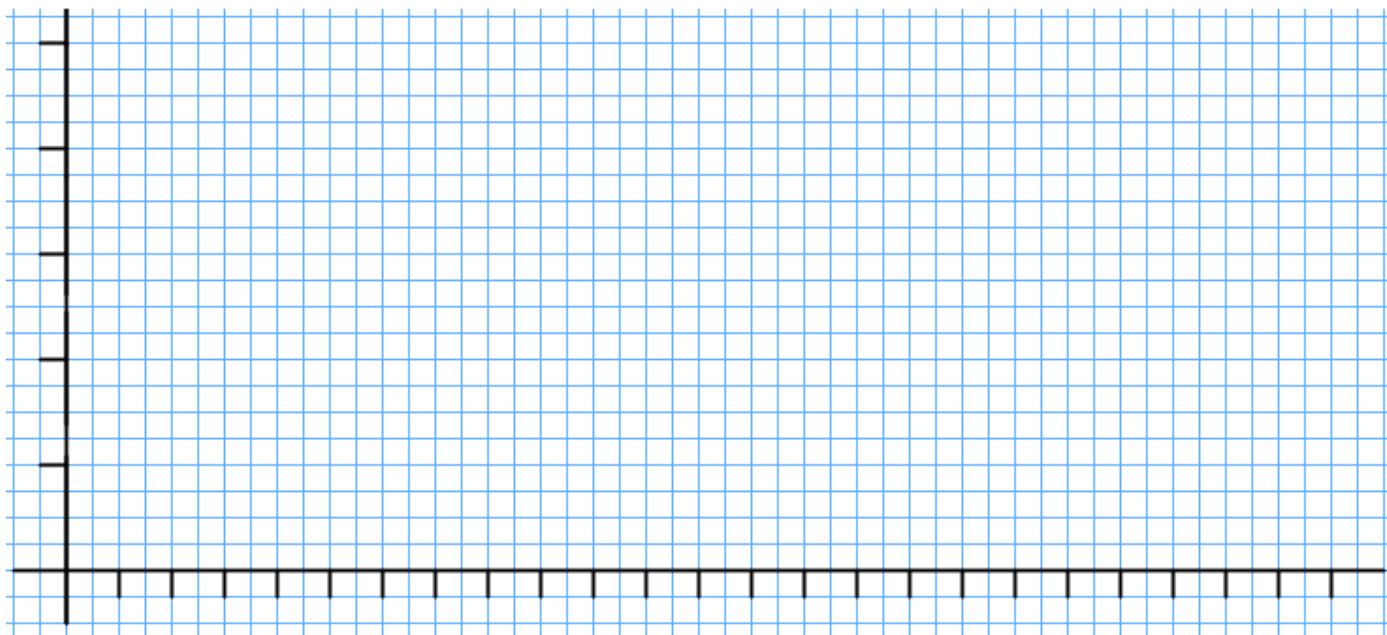
b. Suppose the family decides to keep the house 5 degrees warmer than before. On the same set of axes above, sketch a graph representing the new scenario.

c. On the weekend, the family decided to get up two hours early to go fishing and to come home two hours earlier. They will be so tired they will probably go to bed two hours early too. Therefore, Dad needs to change the thermostat to start and end two hours earlier. On the same set of axes above, sketch a graph representing this new scenario.

Suppose *H = f(t)* is an equation of the function that represents the original heating schedule.

Write an expression that would represent the heating schedule described in part b.

Write an expression that would represent the heating schedule described in part c.