

## Math-19 Section 1

### Homework #3 Solutions

#### Problems

1. The amount of heat energy ( $Q$ ) needed to change the temperature of an object (without going through a phase change like melting or boiling) is jointly proportional to the mass of the object ( $m$ ) and the *change* in temperature ( $\Delta T$ ).

- (a) Write an equation that models this physical phenomenon. Use  $c$  for the constant of proportionality.

$$Q = cm\Delta T$$

- (b) The MKS unit for heat energy is the Joule ( $J$ ). The constant of proportionality is specific to the substance being heated and is referred to as the *specific heat* of the substance. If  $Q$  is measured in Joules ( $J$ ),  $m$  is measured in grams ( $g$ ), and temperature is measured in Kelvin ( $K$ ), what are the units of  $c$ ?

$$J = \left( \frac{J}{gK} \right) gK$$

- (c) In the lab, it is found that 41 790 J of heat energy raises the temperature of 1 L of water by 10 K. What is the specific heat of water? (1 L of water=1000 g)

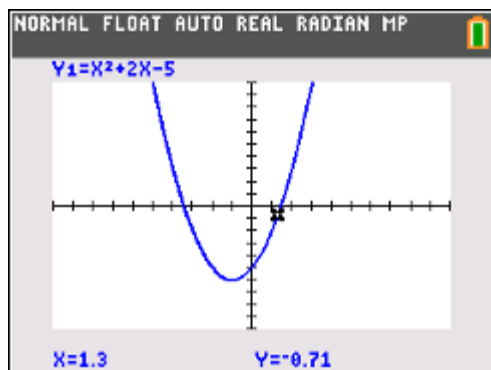
$$c = \frac{J}{m\Delta T} = \frac{41790}{1000 \cdot 10} = 4.1790 \text{ J/gK}$$

2. Consider the equation:

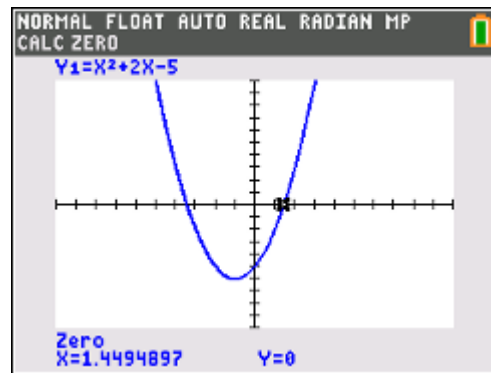
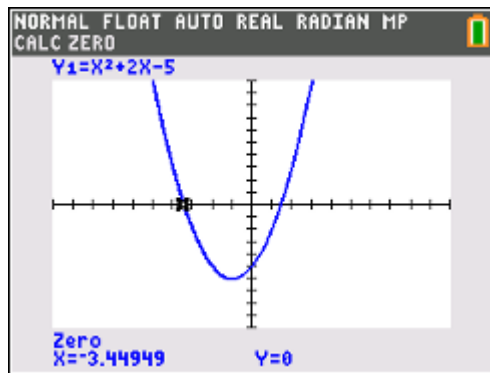
$$y = x^2 + 2x - 5$$

For each of the parts below, use the graphing functions from your TI-84 *calc* menu to find the answers and submit a screen-shot from your calculator that shows the correct answer.

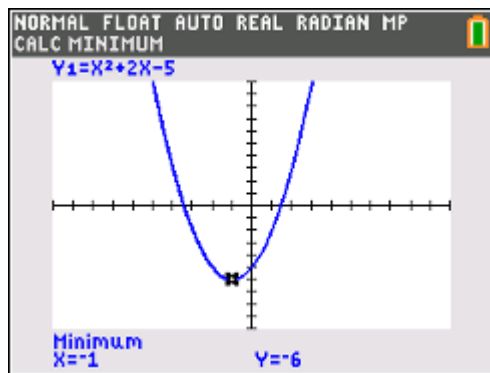
- (a) Find the  $y$ -value when  $x = 1.3$  using the *value* function.



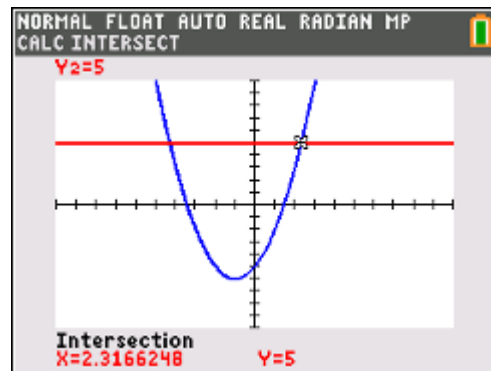
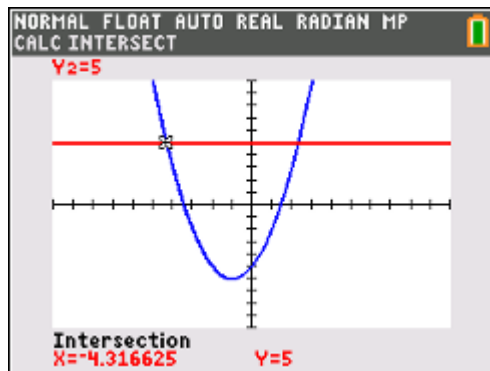
- (b) Find the  $x$ -intercepts using the *zero* function.



- (c) Determine the minimum value using the *minimum* function.



- (d) Determine the  $x$ -values for  $y = 5$  using the *intersect* function. Note that you will need to add something to your graph to do this. Also note that there are multiple answers.



- (e) Now graph the function  $y = x^2 + 11$ . Huh!? Nothing seems to appear! Why, and how can you fix this? Submit a screen shot that uses your fix.

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WINDOW

Xmin=-10  
Xmax=10  
Xscl=1  
Ymin=0  
Ymax=20  
Yscl=1  
Xres=1  
 $\Delta X=0.07575757575757$   
TraceStep=0.151515151515...

