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Instructions: You have 25 minutes for this quiz. You **MUST** show work for credit. No credit for answers only. If in doubt, ask for clarification. Quiz has two problems. When appropriate, use at least two decimal places.

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1. (5pts) Start with the function  $y = f(x) = 2x^2 - x + 1$ . Compute and simplify as far as possible:

$$\begin{aligned} f(x-1) + f(2x) &= (2(x-1)^2 - (x-1) + 1) + (2(2x)^2 - (2x) + 1) \\ &= 2(x^2 - 2x + 1) - x + 1 + 1 + 2(4x^2) - 2x + 1 \\ &= 10x^2 - 7x + 5 \end{aligned}$$

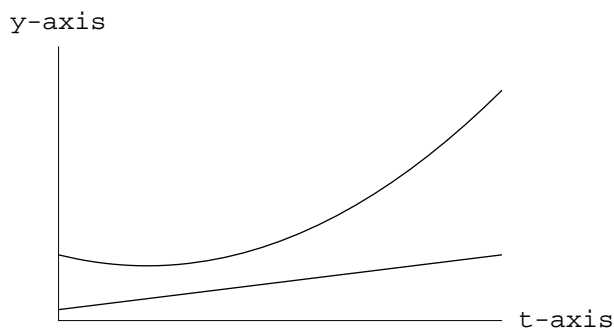
2. (15pts) Two new internet stocks have just been issued. One company, called **bozo.com**, has its stock price  $t$  hours after initial offering modeled by the function

$$b(t) = \frac{1}{10}t^2 - 2t + 60 \text{ dollars.}$$

Another company, called **hiphop.com**, has its stock price  $t$  hours after initial offering modeled by the function

$$r(t) = t + 10 \text{ dollars.}$$

The graphs of these two functions are pictured; this is a graph for the first 50 hours after initial offering.



(a) (6pts) Put the function  $b(t)$  into vertex form.

$a = \frac{1}{10}; b = -2; c = 60$ . So,  $h = \frac{-b}{2a} = \frac{2}{2/10} = 10$  and  $k = b(h) = b(10) = \frac{1}{10}10^2 - 2(10) + 60 = 50$ . Now,

$$\begin{aligned} b(t) &= a(t - h)^2 + k \\ &= \frac{1}{10}(t - 10)^2 + 50 \end{aligned}$$

(b) (2pts) Find the minimum price of **bozo.com** stock.

From the vertex form, the vertex is  $(10, 50)$ , so the minimum price occurs at time  $t = 10$  hours and is \$50.

(c) (7pts) When will the price difference between the two stocks be the smallest and what is the price difference at this time?

To do this, form the NEW function

$$d(t) = b(t) - r(t) = \frac{1}{10}t^2 - 2t + 60 - (t + 10) = \frac{1}{10}t^2 - 3t + 50.$$

We will need to minimize this function to answer the question. To do that, we put  $d(t)$  into vertex form: We see that  $a = \frac{1}{10}; b = -3; c = 50$ . So,  $h = \frac{-b}{2a} = \frac{3}{2/10} = 15$  and  $k = b(h) = b(15) = \frac{1}{10}15^2 - 3(15) + 50 = 27.5$ . Now,

$$\begin{aligned} d(t) &= a(t - h)^2 + k \\ &= \frac{1}{10}(t - 15)^2 + 27.5 \end{aligned}$$

Conclude the difference between the two stock prices is minimized at time  $t = 15$  hours and the difference in price at this time is \$27.50.