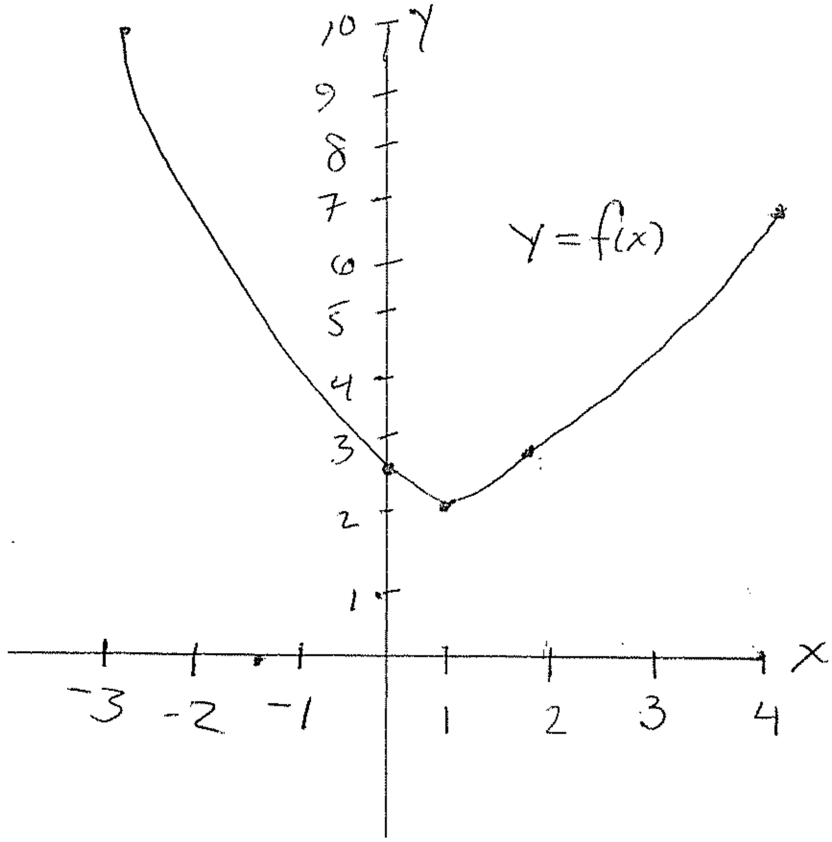
HW 3 Solutions

(1.) $f(x) = \frac{1}{2}(x-1)^2 + 2$

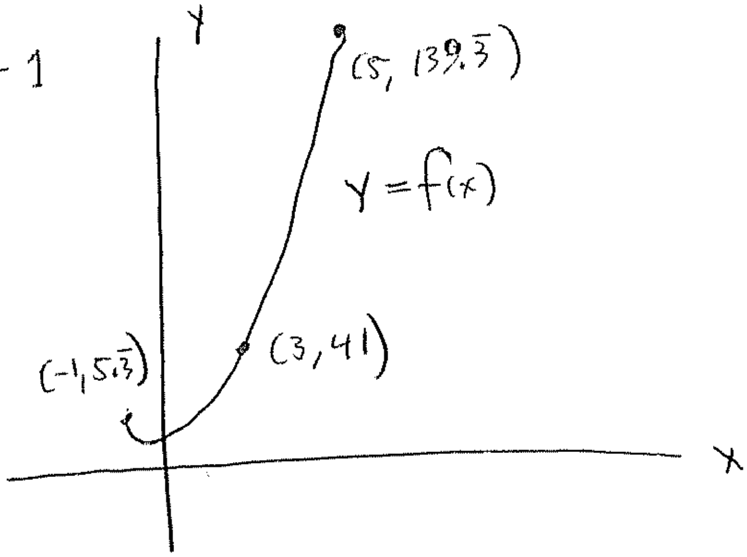
x	f(x)
1	2
2	2.5
0	2.5
4	6.5
-3	10



(2.) The numbers should have been nicer, so I gave full credit to any attempt at this problem.

$f(x) = \frac{1}{3}x^3 + 4x^2 - \frac{2}{3}x + 1$

x	f(x)
-1	$5.\overline{3}$
0	1
2	$18.\overline{3}$
3	41
5	$139.\overline{3}$

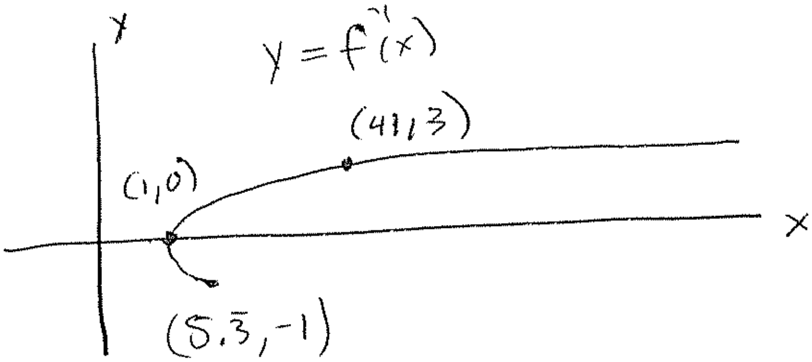


(2.) (cont.) For technical reasons that do not concern us, f does ~~do~~ not have an inverse. If the numbers were nicer, here is the tactic:

$$f(-1) = 5.\bar{3}, \quad \text{so } f^{-1}(5.\bar{3}) = -1$$

$$f(0) = 1, \quad \text{so } f^{-1}(1) = 0 \quad \text{etc.} \ldots$$

x	$f(x)$
$5.\bar{3}$	-1
1	0
$18.\bar{3}$	2
41	3
$139.\bar{3}$	5



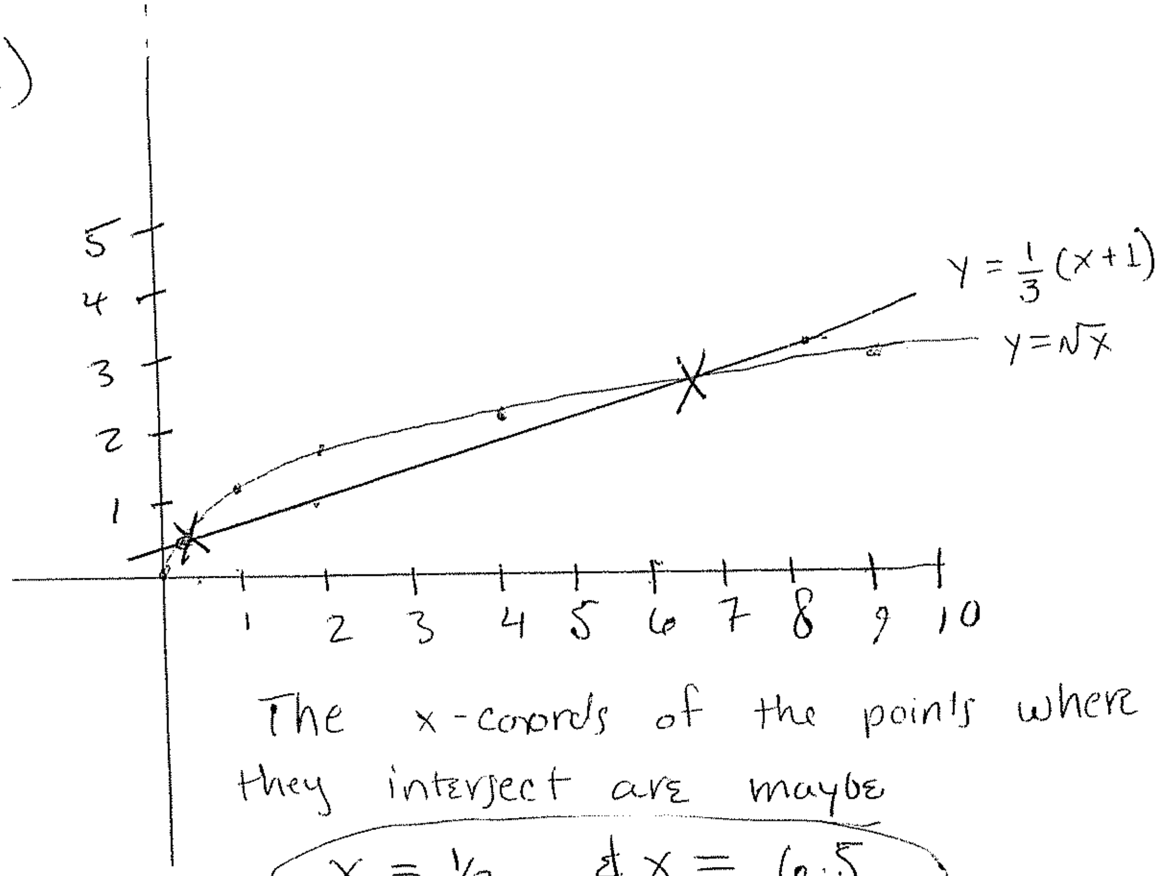
(3.) There are several ways to find the solutions:

1st: Graph the function $\sqrt{x}$, & $\frac{1}{3}(x+1)$ on the same axes, & see where they intersect

x	$\sqrt{x}$
0	0
1	1
2	1.414
4	2
9	3

x	$\frac{1}{3}(x+1)$
0	1/3
1	2/3
2	1
5	2
8	3

(3) (cont.)



The x-coords of the points where they intersect are maybe

$x = 1/2$ & $x = 6.5$

2nd way: Graph $\sqrt{x} - \frac{1}{3}(x+1)$, & see where the y-coord. are 0.

3rd: (Algebraically) $\sqrt{x} = \frac{1}{3}(x+1)$

$$(\sqrt{x})^2 = \left[\frac{1}{3}(x+1)\right]^2$$

$$x = \frac{1}{9}(x^2 + 2x + 1)$$

$$\Rightarrow \quad \frac{1}{9}x^2 - \frac{7}{9}x + \frac{1}{9} = 0$$

$$x^2 - 7x + 1 = 0$$

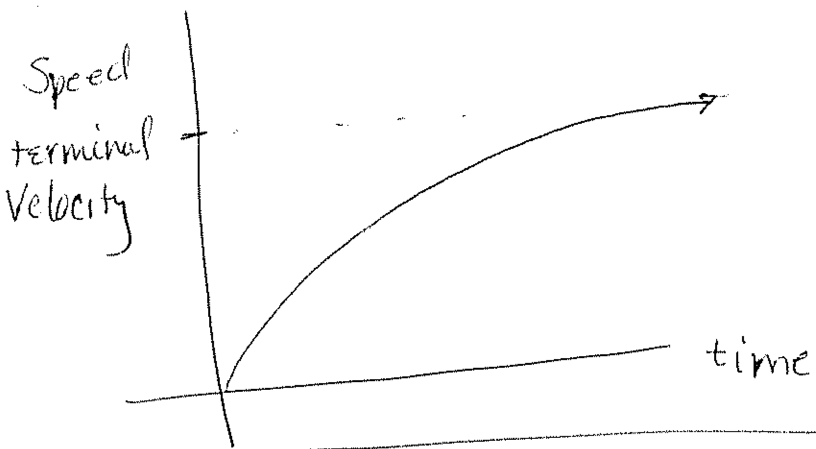
(Quadratic formula)

$$x = \frac{7 \pm \sqrt{49-4}}{2}$$

$$x = \frac{7 \pm \sqrt{45}}{2}$$

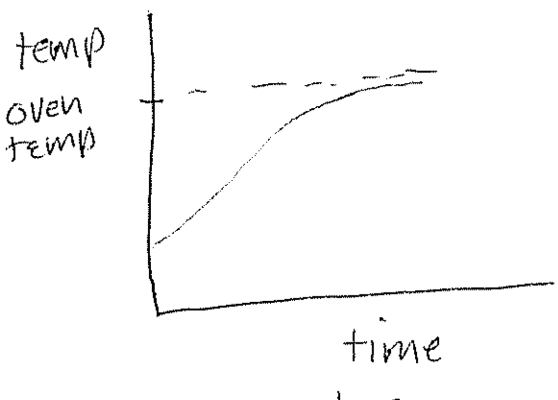
(It doesn't involve graphing, but I accepted it)

(4.) The problem was "Graph Speed". I thought that meant "Graph Speed vs. time". I gave credit to Graphs of Speed vs. position, as long as they showed that Speed could not surpass terminal velocity.

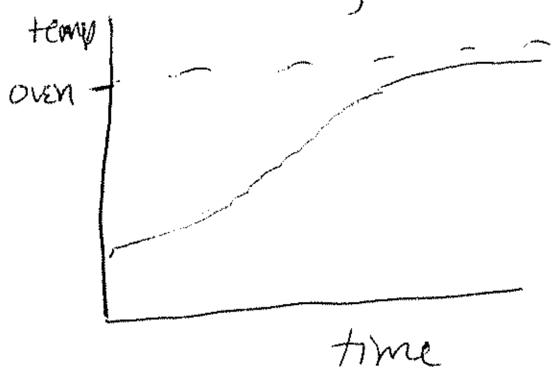


(5.) The further inside the cake, the ~~faster~~ slower it heats up to the oven temp.

Surface



mid way



center