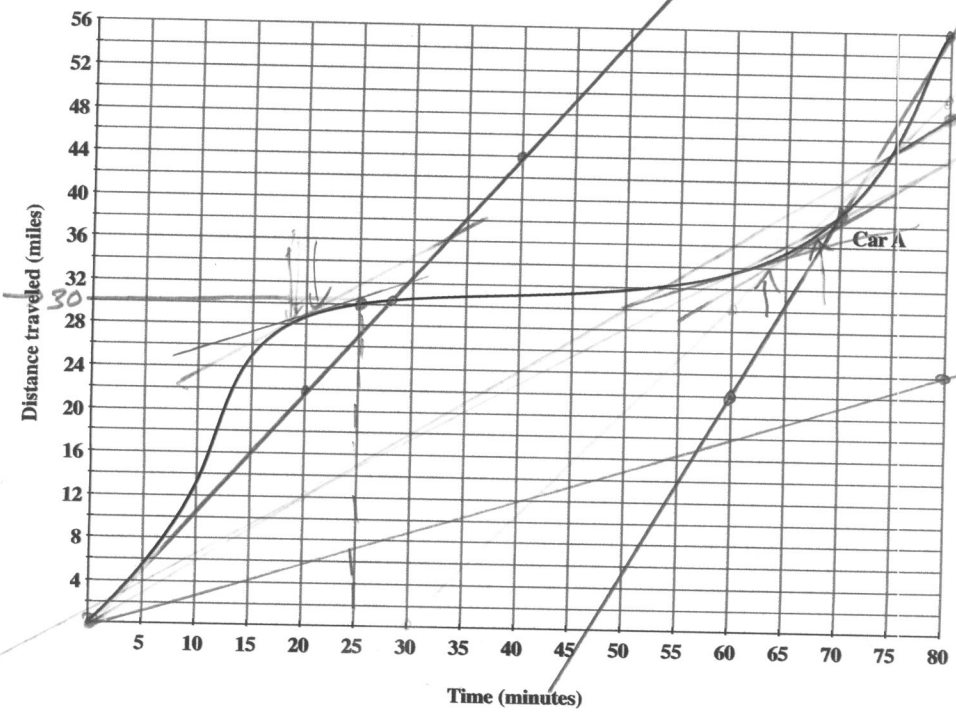
VERSION 2

1. (12 pts) The graph gives total distance traveled vs time by a moving car, Car A. Let $A(t)$ represent the distance traveled by car A in t minutes.



PART (a) SLOPE = 1.1

PART (b)

PART (c)

PART (d)

PART (d)

(a) Find a time at which Car A's average trip speed is 1.1 mpm.

SLOPE = 1.1

SLOPE OF DIAGONAL LINE ← (from 0 to t)

REFERENCE LINE

(0,0) (10, 11), (20,22), ..., (40,44)

$t =$ 28 minutes

(b) Translate the following phrase into functional notation AND compute the value:
Find the average speed of the car over the 10-minute interval starting at $t =$ 70 minutes

2 POINTS: (80,56) (60,22)

$\frac{56-22}{80-60} = \frac{34}{20} = 1.7$

FUNCTIONAL NOTATION: $\frac{A(80) - A(70)}{80 - 70}$

"Average speed from 70 to 80" = 1.7 mpm

(c) Find a value of t such that $A(80) - A(t) = 26$.

CHANGE IN HEIGHT IS 26 miles

From $t = ?$ TO 80 min

$A(80) = 56$ so we want $56 - A(t) = 26 \Rightarrow A(t) = 30$

$t =$ 25 minutes

(d) As accurately as possible, find the two one-minute intervals over which the car's average speed is 0.5 mpm.

REFERENCE LINE

(0,0), (10,5), (50,25), (80,24)

One answer: $t =$ 21 to $t =$ 22 minutes

Another answer: $t =$ 63 to $t =$ 64 minutes

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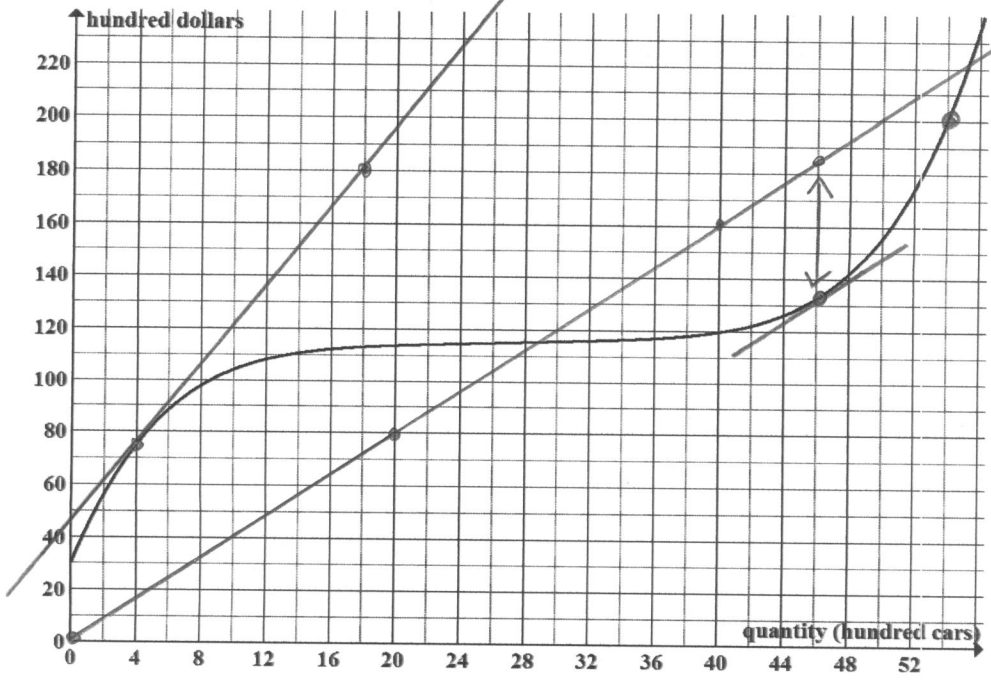
2. (15 pts) The graphs of **total cost** for producing toy cars are given. The x-axis is given in **hundreds of cars** and the y-axis in **hundreds of dollars**.

PART (a)

PART (c) TR

PART (b) TC(54) = 200



(a) As accurately as possible, find the **marginal cost** at 400 cars

DRAW TANGENT AT 400

2 POINTS: (4, 75) (18, 180)

SLOPE $= \frac{180-75}{18-4} = \frac{105}{14} \approx 7.5$

$MC(4) =$ 7.50 dollars per car

(b) Find the **average variable cost** at 5400 cars.

$AVC(54) = \frac{VC(54)}{54}$

$TC(54) = 200$ AND $FC = 30$

$\Rightarrow VC(54) = 170$

SO $AVC(54) = \frac{170}{54} \approx 3.15$

$AVC(54) =$ 3.15 dollars per car

(c) The market price is \$4.00 per car. Find the maximum profit (include units).

$TR(q) = 4q$ (0,0), ..., (20, 80), ..., (40, 160)

SLOPES MATCH AT $q = 46$

$TR(46) = 184$

$TC(46) \approx 135$

PROFIT $\approx 184 - 135 = 49$

Max Profit = 49 Units = hundred dollars

(d) Identify which of the following are true and which are false (clearly circle your answers):

i. (TRUE) or FALSE: From $x = 0$ to $x = 20$, $AC(q)$ is decreasing.

ii. TRUE or (FALSE): From $q = 40$ to $q = 50$, $MC(q)$ is decreasing.

iii. (TRUE) or FALSE: The ~~market~~ price of 4.00 dollars/car is above the Break Even Price (BEP).

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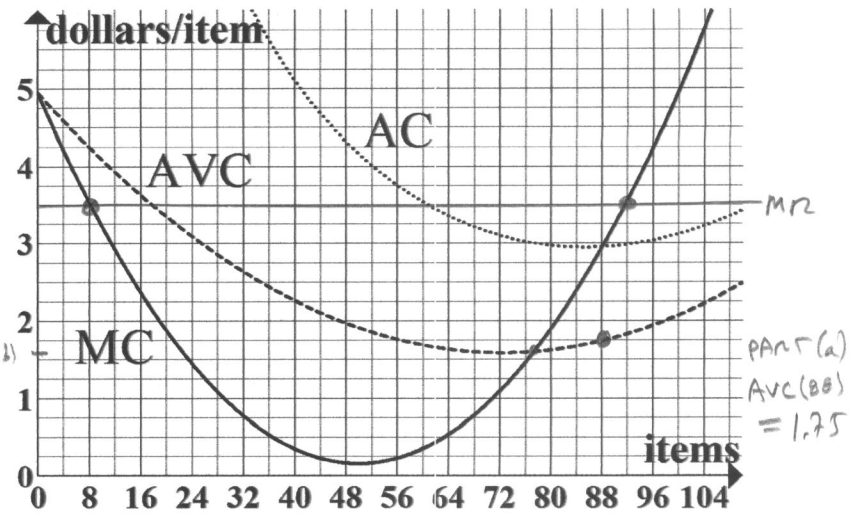
3. (8 pts) Your company produces items. To the right are the graphs of **marginal cost**, **average cost**, and **average variable cost** for producing items over the next month for your company. The quantities are in items and MC, AC, and AVC are in dollars per item.



PART (b)

PART (a)
AVC(88) = 1.75

(a) Give the **variable cost** at 88 items.

$VC(88) = 88 \cdot AVC(88)$
$= 88 \cdot 1.75 = 154$

$VC(88) =$ 154 dollars

(b) If the market price for the month is \$2.25 per item should you STAY OPEN or CLOSE? (Briefly explain why. For full points you must make reference to the appropriate concept and graph value.) Explanation:

SDP $\approx \$1.55$
SINCE \$2.25 IS ABOVE THE SHUTDOWN PRICE, YOU SHOULD STAY OPEN!
IT IS POSSIBLE TO RECOVER SOME FIXED COSTS.

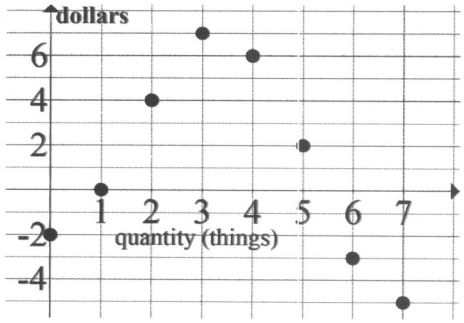
Circle one: (STAY OPEN) or CLOSE.

(c) Suppose the market price is \$3.50 per item. Give the longest interval over which profit is increasing.

MR = 3.50 ⇒ A HORIZONTAL LINE
MR > MC

From $q =$ 8 to $q =$ 92 items

4. (6 pts) Each dot in the graph to the right gives the **change in profit (in dollars) over the next thing** (also known as marginal profit). For example, the dot at (3,7) means that the profit goes up 7 dollars when you go from selling 3 things to 4 things.



(a) Identify which of the following are true and which are false (clearly circle your answers):

i. (TRUE) or FALSE: The profit is higher at $q = 6$ than $q = 7$ things. FROM 6 TO 7 PROFIT GOES DOWN \$3.

ii. TRUE or (FALSE): The profit is higher at $q = 4$ than $q = 5$ things. 4 TO 5 PROFIT GOES UP \$6.

(b) If the profit starts at ~~-5~~ -3 dollars when you sell zero things, then what is the profit if you sell $q = 4$ things?

	PROFIT	
0	-3	-2
1	-5	+0
2	-5	+4
3	-1	+7
4	6	

Profit at $q = 4$ equals 6 dollars

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5. (9 points) (Show your work)

(a) Consider the line $4x + 3y = 48$. Find the x-intercept and y-intercept of the line.

x-intercept $\Rightarrow y=0 \Rightarrow 4x+3(0)=48 \Rightarrow x=\frac{48}{4}=12$

y-intercept $\Rightarrow x=0 \Rightarrow 4(0)+3y=48 \Rightarrow y=\frac{48}{3}=16$

x-intercept: $(x, y) =$ (12, 0)

y-intercept: $(x, y) =$ (0, 16)

(b) Find the equation of the line that goes through $(1, 16)$ and $(6, 10)$.

$m = \frac{10-16}{6-1} = \frac{-6}{5} = -1.2$

$y = -1.2(x-1)+16$

$y = -1.2x + 1.2 + 16$

$y = -1.2x + 17.2$

$y = -1.2(x-6)+10$

ALL ACCEPTABLE

Equation for Line: $y = -1.2x + 17.2$

(c) For a certain product, the revenue is given by $TR(x) = \frac{7x}{2}$ and the total cost is given by $TC(x) = \frac{4x+50}{5}$ where x is in **thousands items**.
For what values of x will there be a positive profit?
(Round all numbers in your final answer to the nearest item).

WANT $TR > TC$

$\frac{7x}{2} > \frac{4x+50}{5}$

$7x > 2 \cdot \frac{(4x+50)}{5}$

$35x > 2(4x+50)$

$35x > 8x + 100$

$27x > 100$

$x > \frac{100}{27} = 3.703703$

NEAREST ITEM!

Answer: $x > 3.704$

also accept $\geq$