1. A privately owned summer camp across from Camp Crystal Lake for youngsters has the following data for a 12-week session::
   a. Develop the mathematical relationships for total cost and total revenue.
   C = the number of campers per week
   Total cost = fixed costs + variable cost per camper * the number of camper * 12 = 192,000 + 320 * C * 12

   Total revenue = charge per camper * the number of campers per week * 12 = 480 * C * 12

   b. What is the total number of campers that will allow the camp to breakeven?

   Breakeven: total cost = total revenue

   Breakeven = 192,000 + 320 *C *12 = 480 *C * 12
   1920 C = 192,000
   C = 100 for a week

   c. What is the profit or loss for the 12-week session if the camp operates at 80% capacity?

   80% capacity means C = 200 * 80% = 160 campers
   Total profit (160) = total revenue (160) – total cost (160)
   = (480 *160 * 12) – (192,000 + 320 * 160 * 12)
   = $115,200

   d. What are the marginal and average costs per camper at 80% capacity?
   Marginal cost is the variable cost for one more unit, while the average cost is the total cost divided by the number of units.
   Marginal cost = 320
   Average cost = (192,00 + 320 * 160 *12) / (160 * 12) = 420

Charge per camper	$480 per week
Fixed costs	$192,000 per session
Variable cost per camper	$320 per week
Capacity	200 campers

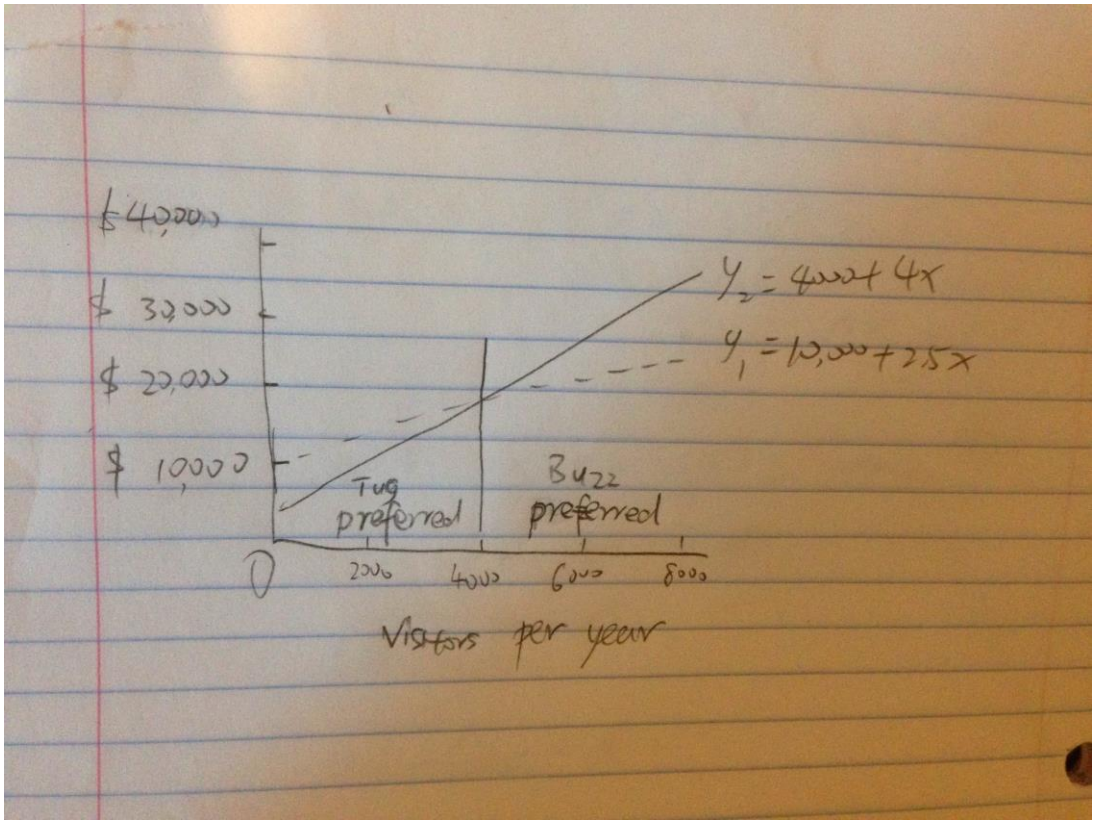
2. Two new rides are being compared by a local amusement park in terms of their annual operating costs. The two rides are assumed to be able to generate the same level of revenue (therefore the focus on costs). The Tummy Tugger has a fixed cost of $10,000 per year and a variable cost

of $2.50 per visitor. The Head Buzzer has a fixed cost of $4,000 per year a variable cost of $4 per visitor. Provide answers to the following questions:

a. Mathematically determine the breakeven number of visitors per year for the two rides to have equal annual costs.

$$10{,}000 + 2.5X = 4{,}000 + 4X$$
$$6000 = 1.5X$$
$$X = 4000 \text{ number of visitor}$$

b. Develop a breakeven graph that illustrates the following:
   i. Accurate total cost lines for the two alternatives (show lines and equations)
   ii. The breakeven point for the two rides in terms of number of visitors.
   iii. The ranges of visitors per year where each alternative is preferred.



3. Company A has fixed expenses of $15,000 per year and each unit of product has a $0.20 variable cost. Company B has fixed expenses of $5,000 per year and can produce the same product at $0.50 variable cost. At what number of units annual production will Company A have the

same overall cost as Company B?

Total cost = total fixed cost + total variable cost

= total fixed cost + variable cost per product * quantity (X)

Company A total cost = 15,000 + .2 *X

Company B total cost = 5000 + .5 * X

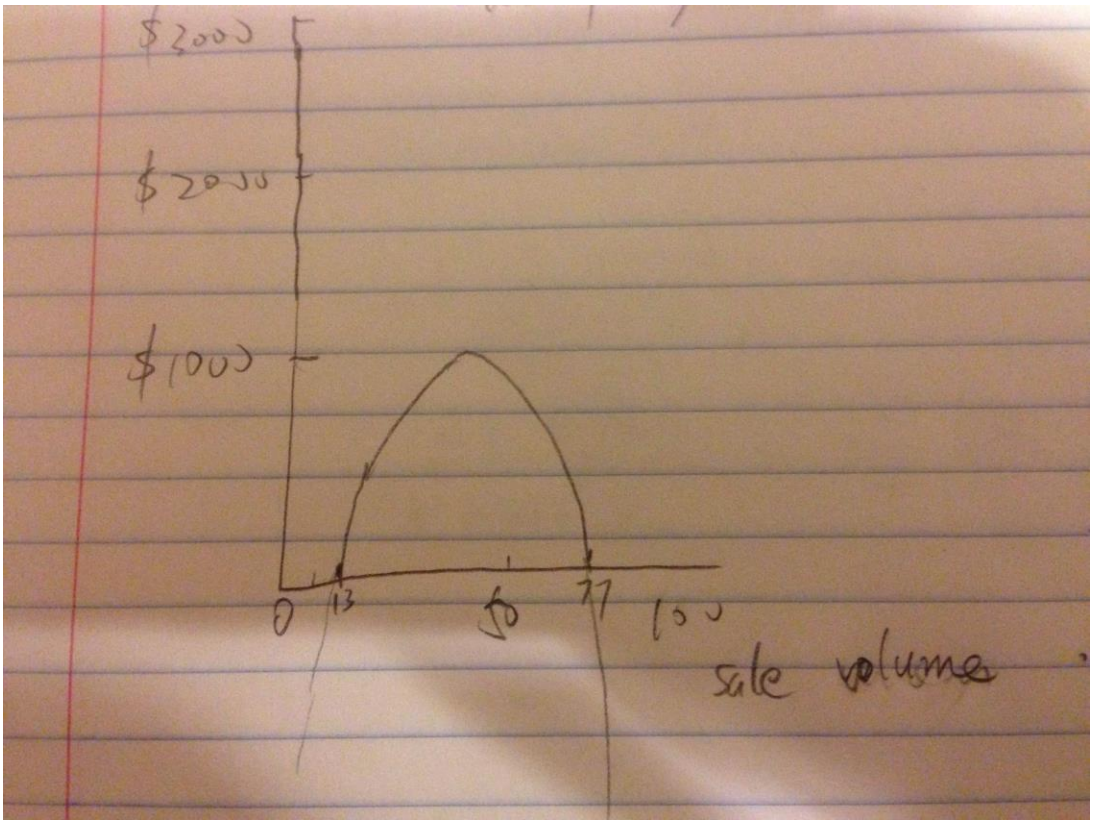
15,000 + .2 *X = 5000 + .5 * X

X = 33.33 units

4. A firm believes a product's sales volume (S) depends on its unit selling price (P) and the following formula as S=$100-P. The production cost (C) formula they use is C=$1,000+10S.
    a. Draw a graph with the sales volume (S) from 0 to 100 on the x-axis and the total cost and total income from $0 to $2,500 on the y-axis. On the graph draw a line C=$1,000+10S. Then plot the curve of total income. Mark the breakeven points on the graph.

Profit = S (100 – S) – 1000 -10S

= -S^2 + 90 S – 1000



    b. Determine the breakeven point (lowest sales volume at which total sales income just equals total production cost). (Hint: This may be done by trial and error or by using the quadratic equation to locate the point at which the profit is zero – Thank You MA 141!).

Set profit =0

-S^2 + 90 S – 1000 = 0

S = 13 or 77

c. Determine the sales volume (S) at which the firm's profit is at maximum. (Hint: Write an equation for profit and solve it by trial and error or as a minima-maxima calculus problem – Again MA 141 raises its head!).

dp / ds = -2s + 90 =0

s = 45 units

So the maximum profit is 45 units