7. [13 points] After testing different ingredients in their parents’ garages, Imran and Nicole have recently opened new organic peanut butter companies.

a. [3 points] Two months after opening, Imran’s company, Chunky Munky, has produced a total of 256 pounds of peanut butter. Imran thinks Chunky Munky produces peanut butter at a constant rate of 690 pounds every 6 months. Assuming Imran is correct, write a formula for $P(m)$, the total amount of peanut butter, in pounds, that Chunky Munky will have produced $m$ months after opening.

**Answer:** $P(m) =$

b. [4 points] Nicole’s company, Lots O’ Crunch, has produced a total of 182 pounds of peanut butter two months after opening and a total 454 pounds of peanut butter five months after opening. Nicole thinks that Lots O’ Crunch produces peanut butter exponentially. Assuming Nicole is correct, write a formula for $Q(x)$, the total amount of peanut butter, in pounds, Lots O’ Crunch will have produced $x$ months after opening. *Decimal approximations must be rounded to at least three decimal places.*

**Answer:** $Q(x) =$
Ann Arbor’s leading local peanut butter company is Sticky PB Company. The total amount of peanut butter produced by Sticky PB Company $m$ months after Chunky Munky opens is given by

$$S(m) = 1500e^{0.32m}.$$  

c. [2 points] By what percent is Sticky PB Company’s production growing every month? Round your answer to two decimal places.

Answer: _____________________


d. [4 points] After a lot of analysis, Imran determines that Chunky Munky’s total peanut butter production $m$ months after opening is best modeled by the exponential function

$$C(m) = 100(1.6)^m.$$  

According to this model, when will Chunky Munky and Sticky PB Company have produced the same amount of peanut butter? Show all your work and leave your answer in exact form.

Answer: _______________________________________ months