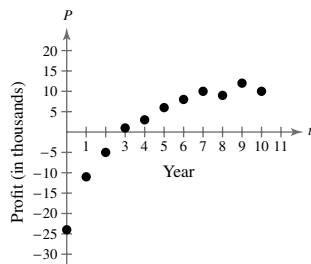


Collaborative Project – Equations, Inequalities, and Mathematical Modeling

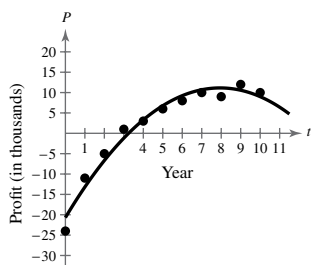
1. a.



Sample answer: $P = 2.7t - 11$

- b. (4.07, 0); The food truck broke even in its fourth year of operation.
- c. Years 6, 7, 8, 9, and 10 ($5.56 \leq t \leq 10$)
- d. No, the linear model is not close to all the data points and the break-even point is off by more than a year.

2. a.



- b. (3.24, 0); The food truck broke even in its third year of operation.
- c. Years 5, 6, 7, 8, 9, and 10 ($4.75 \leq t \leq 10$); yes
- d. Not possible; $-7.9406 \pm 1.303i$; the solutions are not real so the profit never reaches \$12,000
- e. *Sample answer:* Yes, the graph is close to most of the data.
- f. *Sample answer:* No, the model predicts that profit will drop rapidly for $t > 10$.
3. a. Years 5, 6, 7, 8, 9, and 10 ($5.40 \leq t \leq 10$); no
- b. Years 0, 1, 2, and 3 ($0 \leq t \leq 3.68$)
- c. *Sample answer:* Yes, the model predicts that profit will continue to rise, but at a slowing rate, which seems reasonable.
4. *Sample answer:* The rational model is the best because it is close to most of the data and predicts reasonable future values.