Word Problems Practice

1. The population (in hundreds of thousands) of Florida from 2000 to 2007 can be approximated by the function \( f(x) = 3.14x + 160.5 \). Similarly, the population (in hundreds of thousands) of New York during the same period can be approximated by the function \( g(x) = .43x + 190 \).

(a) Graph both functions on the same coordinate axis, with \( x = 0 \) corresponding to the year 2000 and \( x = 7 \) corresponding to 2007.
(b) Do the graphs intersect in this window?
(c) If trends continue at the same rate, will Florida overtake New York in population?
(d) Estimate in what year Florida will overtake New York in population.

2. Let the supply and demand for bananas in cents per pound be given by

\[
\text{supply: } p = \frac{2}{5}q; \quad \text{demand: } p = 100 - \frac{2}{5}q.
\]

(a) Graph these equations on the same axes.
(b) Find the equilibrium quantity.
(c) Find the equilibrium price.
(d) On what interval does demand exceed supply?

3. Suppose you are the manager of a firm. The accounting department has determined that the cost estimate for a new product is \( C(x) = 80x + 7000 \). The sales department expects a revenue of \( 95x \). You know that you can only produce at most 400 units.

(a) How many units must the firm sell to break even?
(b) Should the new product go into production?

4. Carol Bey makes and sells candy. She has found that the cost per box for making \( x \) boxes of candy is given by

\[
C(x) = x^2 - 40x + 405.
\]

(a) How much does it cost per box to make 15 boxes? 18 boxes? 30 boxes?
(b) Graph the cost function \( C(x) \), and mark the points corresponding to 15, 18 and 30 boxes.
(c) What point on the graph corresponds to the number of boxes that will make the cost per box as small as possible?
(d) How many boxes should she make in order to keep the cost per box at a minimum? What is the minimum cost per box?

5. The rental manager of a small apartment complex with 16 units has found from experience that each $40 increase in the monthly rent results in an empty apartment. All 16 apartments will be rented at a monthly rent of $500. How many $40 increases will produce maximum monthly income for the complex?