Systems of Equations

Finite Math

6 March 2017

Quiz

What possibilities are there for the number of solutions of a system of equations?

Other Types of Solutions

We now want to look at the case when the system does not have one unique solution, but is either inconsistent or is consistent but dependent.

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$$\begin{aligned} x - \tfrac{1}{2}y &= 4 \\ -2x + y &= -8 \end{aligned}$$

Now You Try It!

Example

Solve the systems

(a)

$$\begin{aligned} 5x + 4y &= 4 \\ 10x + 8y &= 4 \end{aligned}$$

(b)

$$\begin{aligned} 6x - 5y &= 10 \\ -12x + 10y &= -20 \end{aligned}$$

Applications

There are a variety of applications of systems of equations. For a simple example, consider the following

Example

Dennis wants to use cottage cheese and yogurt to increase the amount of protein and calcium in his daily diet. An ounce of cottage cheese contains 3 *grams of protein and* 15 *milligrams of calcium. An ounce of yogurt contains* 1 *gram of protein and* 41 *milligrams of calcium. How many ounces of cottage cheese and yogurt should Dennis eat each day to provide exactly* 62 *grams of protein and* 760 *milligrams of calcium?*

Now You Try It!

Example

A fruit grower uses two types of fertilizer in an orange grove, brand A and brand B. Each bag of brand A contains 8 pounds of nitrogen and 4 pounds of phosphoric acid. Each bag of brand B contains 7 pounds of nitrogen and 6 pounds of phosphoric acid. Tests indicate that the grove needs 720 pounds of nitrogen and 500 pounds of phosphoric acid. How many bags of each brand should be used to provide the required amounts of nitrogen and phosphoric acid?

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Solution

41 *bags of brand A and* 56 *bags of brand B.*

Free Market

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Example

At a price of \$1.88 *per pound, the supply for cherries in a large city is* 16,000 *pounds and the demand is* 10,600 *pounds. When the price drops to* \$1.46 *per pound, the supply decreases to* 10,000 *pounds and the demand increases to* 12,700 *pounds. Assume that the price-supply and price-demand equations are linear.*

(a) *Find the price-supply equation.*

(b) *Find the price-demand equation.*

(c) *Find the supply and demand at a price of* \$2.09 *per pound.*

(d) *Find the supply and demand at a price of* \$1.32 *per pound.*

(e) *Find the equilibrium price and equilibrium demand.*