Secondary 4 Mathematics · Practice Worksheet · tutorinmontreal.ca

Linear Algebra

Name: _____ Date: _____

Concepts

- Linear Algebra (theory)
- Solving First- or Second-Degree System of Equations (Semi-Linear)

Linear Algebra

1. Below are three systems of two equations in x and y. For each one, say whether it is *linear* (both equations of the first degree), *semi-linear* (one first-degree equation and one second-degree equation) or *neither*, and state how many solution points it has. You may answer the counting part without solving the system completely.

a) $\begin{cases} y = 3x - 5 \\ y = -x + 7 \end{cases}$

b) $\begin{cases} y = 2x + 1 \\ y = x^2 - 4x + 5 \end{cases}$

c) $\begin{cases} y = x^2 - 3 \\ y = -x^2 + 9x \end{cases}$

Solving First- or Second-Degree System of Equations (Semi-Linear)

2. Solve the semi-linear system

$$\begin{cases} y = 2x + 3 \\ y = x^2 + 4x + 3 \end{cases}$$

and give both solution points.

3. A ski resort tests a snow gun. The jet of snow leaves the nozzle at the origin and follows the curve $y = -0.05x^2 + 2x$, where x is the horizontal distance and y the height, both in metres. A straight guard cable is anchored 10 m above the nozzle and rises with a slope of 0.5.

a) Write the equation of the cable and find every point where the jet crosses it.

b) Over what horizontal distance is the jet higher than the cable?

4. A decorative water jet in a park follows the path $y = -0.25x^2 + 3x$ (x and y in metres). A flat glass panel is installed along the straight line $y = x + 4$. Determine how many points of the jet touch the panel, and where. Then say in one sentence what this means for the panel.

Synthesis — drawing on several sheets in this topic

5. An outdoor climbing gym stretches a safety net whose upper edge follows the curve $y = -0.05x^2 + 1.8x$, where x is the horizontal distance from the anchor plate and y the height, both in metres. A straight handrail runs from the top of a 4 m post at $x = 0$ up to the top of a 16 m post at $x = 20$ m.

a) Classify the system formed by the net edge and the handrail, then find every point where they meet.

b) Between the two points found in a), the net edge runs above the rail. A climber can slip through wherever this vertical gap is more than 3 m. Find the greatest gap on that stretch and where it occurs, and say whether the gym must add padding and over what horizontal interval.