Systems of Linear-Quadratic Equations

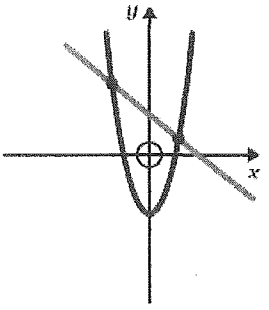
Recall:

The graph of a linear equation is a _____.

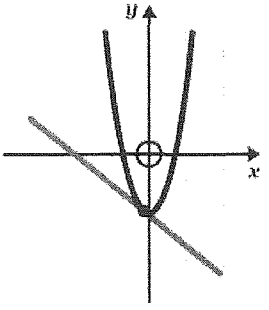
The graph of a quadratic equation is a _____.

The diagrams below illustrate all the possible scenarios, in terms of intersection points, between a line and a parabola.

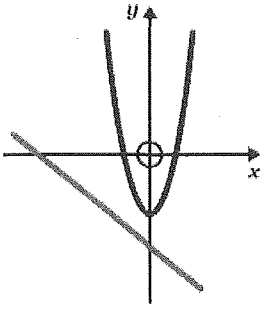
Scenario 1:



Scenario 2:



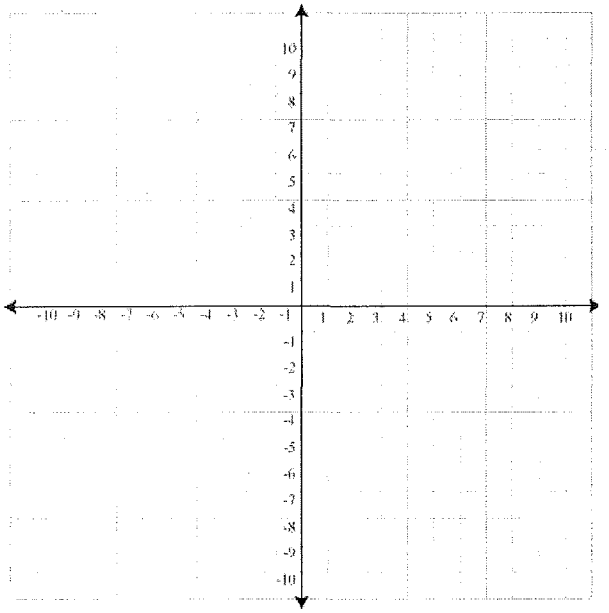
Scenario 3:



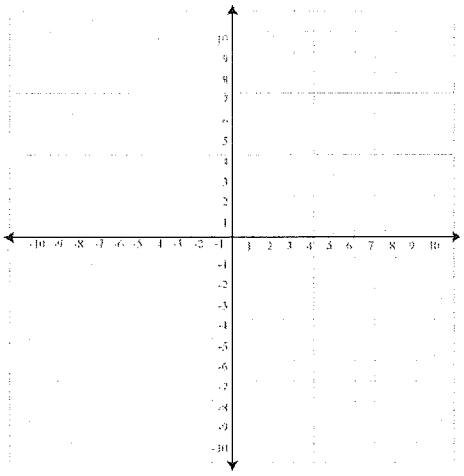
As in the case of a system of two linear equations, the intersection point(s) of a linear equation with a quadratic equation can be found graphically and/or algebraically.

Ex1. Find the point(s) of intersection of the given parabola and line. Solve graphically using desmos and algebraically.

a) $y = -x^2 + 4x + 2$ **and** $y = x + 2$



b) $y = x^2 + 2x - 3$ **and** $y = 4x - 4$



Ex2. Determine the number of points of intersection of $y = 3x^2 + 12x + 14$ and $y = 2x - 8$ without solving.

Ex3. The revenue equation for a company is $R(t) = -40t^2 + 300t$, where t is the ticket price in dollars. The cost equation is $C(t) = 1600 - 220t$. Determine the ticket price that will allow the company to break even.

Ex4. Determine the value(s) of k such that the linear equation $y = -5x + k$ does not intersect the parabola $y = -2x^2 + 3x + 1$.

Intersection of Linear and Quadratic Functions

1. Find the intersection of
   a) $y = x^2 - 5x + 11$ and $y = 3x - 4$.

   b) $y = -3x^2 - x + 9$ and $y = -8x + 11$.

   c) $y + 8 = 5x^2 + 2x$ and $y + 7 = 6x$.

Homework: p. 198 #1-4, 6, 8, 12

1a) (3, 5), (5, 11) b) $\left(\frac{1}{3}, \frac{25}{3}\right)$, (2, -5) c) $\left(-\frac{1}{5}, -\frac{41}{5}\right)$, (1, -1)