Quadratic Formula Program

PRGM Key - Type in name of program
Prompt A,B,C  (PRGM, I/O)
(B^2-4AC)→D  (STO→)
If D≥0  (PRGM) (2nd TEST)
Then
Disp (-(B+√(D))/(2A))→Frac  (PRGM I/O)
Disp (-(B-√(D))/(2A))→Frac
Else
Disp "NO REAL ZEROS"  (PRGM) Quotes above the + sign
Disp "DISCRIMINANT "
Disp D
End  (PRGM)

Now try these:

x^2 - x - 12  x^2 + 3x + 5

PRGM  PRGM
QUAD <enter> QUAD <enter>
PrgmQUAD <enter> PrgmQUAD <enter>
A=? 1 <enter> A=? 1 <enter>
B=? -1 <enter> B=? 3 <enter>
C=? -12 <enter> C=? 5 <enter>

4
-3
Done

4
-3
Done

NO REAL ZEROS
DISCRIMINANT
-11
Done
The Parabolic Path of a Punted Football

The height of a punted football, \( f(x) \), in feet, can be modeled by

\[
f(x) = -0.01x^2 + 1.18x + 2
\]

were \( x \) is the ball's horizontal distance, in feet, from the point of impact with the kicker's foot.

What is the maximum height of the punt and how far from the point of impact does this occur?

1. Algebraically
   
   \[
   \text{Vertex } \left( -\frac{b}{2a}, \frac{-1.18}{2(-.01)} \right) \\
   = (59, 36.8)
   \]

2. Graphing Calc
   
   \[
   y = -0.01x^2 + 1.18x + 2
   \]
   
   Window
   
   \[
   \begin{align*}
   0 &\leq x \leq 150 \\
   0 &\leq y \leq 60
   \end{align*}
   \]

f(x) = -0.01x^2 + 1.18x + 2

How far must the nearest defensive player, who is 6 feet from the kicker's point of impact, reach to block the punt?

1. Algebraically
   
   \[
   f(6) = -0.01(6)^2 + 1.18(6) + 2
   \]
   
   \[
   f(6) = 8.72 \text{ ft}
   \]

2. Graphing Calc
   
   Calc value
If the ball is not blocked by the defensive player, how far down the field will it go before hitting the ground?

1. Algebraically
   \[0 = -0.01x^2 + 1.18x + 2\]
   Quad program
   \[-1.67, 119.67\]

2. Graphing calculator
   Calculator zero

Graph the function that models the football's parabolic path.
Minimizing a Product

Among all pairs of numbers whose difference is 10, find a pair whose product is as small as possible. What is the minimum product?

\[
\begin{array}{ccc}
\hline
x & y & x \cdot y \\
25 & 15 & 375 \\
12 & 2 & 24 \\
10 & 0 & 0 \\
5 & -5 & -25 \\
\hline
\end{array}
\]

\[x - y = 10\]
\[-y = -x + 10\]
\[y = x - 10\]
\[xy = \text{min}\]
\[x(x - 10) = \text{min}\]
\[x^2 - 10x = \text{min}\]

Vertex: \(\frac{-b}{2a}\)

\[
\frac{10}{2(1)} = 5
\]

\[x = 5, y = -5\]

Maximizing Area

You have 100 yards of fencing to enclose a rectangular region. Find the dimensions of the rectangle that maximize the enclosed area. What is the maximum area?

\[P = 2x + 2y\]
\[100 = 2x + 2y\]
\[y = 50 - x\]
\[A = xy\]
\[A = x(50 - x)\]
\[A = 50x - x^2\]
\[A = -x^2 + 50x\]

Vertex: \(\frac{-b}{2a}\)

\[
\frac{-50}{2(-1)} = \frac{25}{2}
\]

(25, 25)
Writing the Equation of a Parabola

Vertex (3, 5) through the point (1, -11)

Vertex form

\[ y = a(x-h)^2 + k \]

\[ y = a(x-3)^2 + 5 \]

\[ -11 = a(1-3)^2 + 5 \]

\[ -16 = 4a + 5 \]

\[ -21 = 4a \]

\[ -4 = a \]

\[ y = -4(x-3)^2 + 5 \]

Assignment  Lesson 2.2 Day 2

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