Lesson Title 11.2 Using the Discriminant & Word Problems DAY TWO NOTES B2A2 Date _____

OBJECTIVE 2: Using the Discriminant

The point of the discriminant is to have a quick easy way to know what your answers and graph should look like. Quadratics can have three different types of answers.

Why waste time with the whole quadratic formula, if you can do the discriminant faster.

Discriminant = $b^2 - 4ac$

- If the discriminant has a **positive** value, then you have **two real** solutions.
  - Your parabola will cross the x-axis twice.
- If the discriminant has a **negative** value, then you have **two imaginary** solutions.
  - Your parabola will NEVER cross the x-axis.
- If the discriminant equals **zero**, then you will ONLY have **one real** solution.
  - Your parabola will have a vertex on the x-axis and that value counts twice.

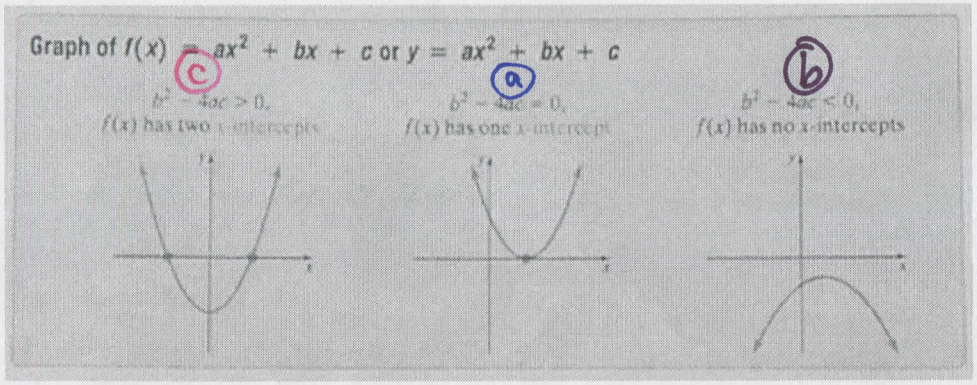
b^2-4ac

TASK 9: Use the discriminant to determine the number and type of solutions of each quadratic equation.

a) $x^2 + 2x + 1 = 0$ $a=1$ $b=2$ $c=1$ $(2)^2-4(1)(1)=0$ → 1 real root

b) $3x^2 + 2 = 0$ $a=3$ $b=0$ $c=2$ $(0)^2-4(3)(2)=-24$ → 2 non-real solutions

c) $2x^2 - 7x - 4 = 0$ $a=2$ $b=-7$ $c=-4$ $(-7)^2-4(2)(-4)=8$ → 2 real roots

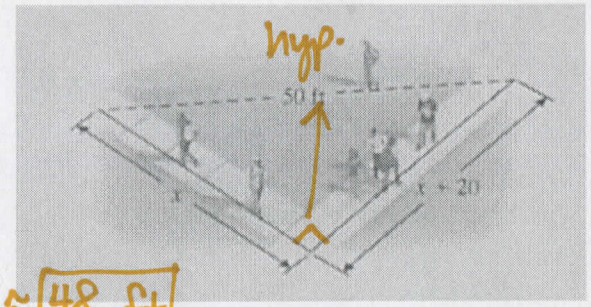


FOIL $(x+20)(x+20)$ $x^2+40x+400$ → $x^2+x^2+40x+400=2500$ ← $x^2+(x+20)^2=(50)^2$

OBJECTIVE 3: Solving Problems Modeled by Quadratic Equations

TASK 10: Calculating Distance Saved

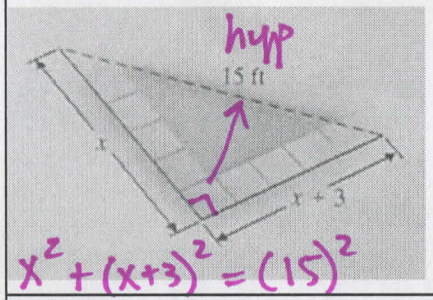
a) At a local university, students often leave the sidewalk and cut across the lawn to save walking distance. Given the diagram below of a favorite place to cut across the lawn, approximate how many feet of walking distance a student saves by cutting across the lawn instead of walking on the sidewalk.



$a=2$ $b=40$ $c=-2100$

$2x^2+40x-2100=0$

$x=\frac{-(40)\pm\sqrt{(40)^2-4(2)(-2100)}}{2(2)}\approx 47.823\approx$ **48 ft**



$x^2+(x+3)^2=(15)^2$

b) Using the new diagram, approximate to the nearest foot how many feet of walking distance a person can save by cutting across the lawn instead of walking on the sidewalk.

$x=\frac{-6\pm\sqrt{(6)^2-4(2)(-216)}}{2(2)}=\frac{-6\pm\sqrt{1764}}{4}$

$\approx$ **9 ft**

$x^2+(x+3)(x+3)=225$

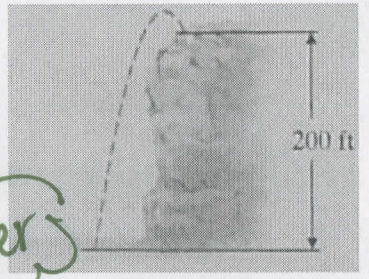
$x^2+x^2+6x+9-225=0$

$2x^2+6x-216=0$

$a=2$ $b=6$ $c=-216$

TASK 11: Calculating Landing Time

a) An object is thrown upward from the top of a 200-foot cliff with a velocity of 12 feet per second. The height h in feet of the object after t seconds is $h = -16t^2 + 12t + 200$. How long after the object is thrown will it strike the ground? Round to the nearest tenth of a second.



$a=-16$ $b=12$ $c=200$

$x=\frac{-(12)\pm\sqrt{(12)^2-4(-16)(200)}}{2(-16)}\approx$ **3.9 secs**

only the positive answer

b) A toy rocket is shot upward from the top of a 45-foot-tall building, with an initial velocity of 20 feet per second. The height h in feet of the rocket after t seconds is $h = -16t^2 + 20t + 45$. How long after the rocket is launched will it strike the ground? Round to the nearest tenth of a second.

$a=-16$ $b=20$ $c=45$

$x=\frac{-(20)\pm\sqrt{(20)^2-4(-16)(45)}}{2(-16)}\approx$ **2.4 secs**

only positive answer

Still need help with: