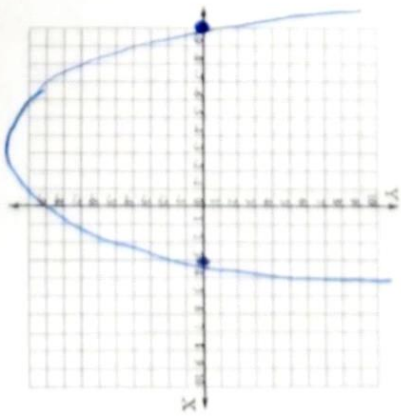
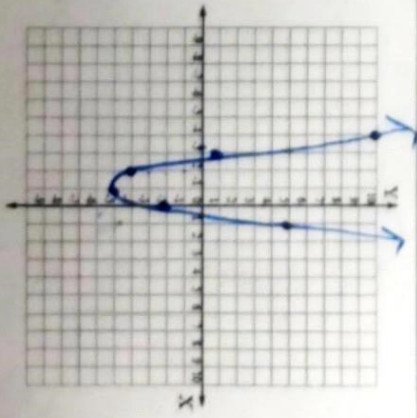


The Discriminant (part of the quadratic formula)

- The discriminant is the part of the quadratic formula inside of the radical $b^2 - 4ac$
- It tells us how many solutions (zeros) a quadratic equation will have
- If the discriminant is **Positive Perfect Square** it will have **2 real rational solutions**
- If the discriminant is **Positive** it will have **2 irrational solutions**
- If the discriminant is **Zero** it will have **1 real rational solution**
- If the discriminant is **Negative** it will have **no real solutions**

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

| Equation | Number of solutions | Zeros | Graph |
|--|--|---|--|
| $f(x) = x^2 + 7x - 30$ | $a=1$ $b=7$ $c=-30$ $(7^2 - 4(1)(-30))$ 169 2 real RATIONAL SOLUTIONS | $(x+10)(x-3) = 0$ $x = -10$ $x = 3$ | <p>*much of the points to of the graph (so we will just sketch)</p>  |
| $-3x^2 + 5x - 5 = -5x^2 - 3 + 5x^2 + 3 + 5x^2 + 3$ | $2x^2 + 5x - 2 = 0$ $a=2$ $b=5$ $c=-2$ $(5)^2 - 4(2)(-2)$ 41 2 IRRATIONAL SOLUTIONS | <p>IRRATIONAL will NOT factor so lets use quadratic formula</p> $\frac{-5 \pm \sqrt{41}}{2(2)}$ $x = \frac{-5 \pm \sqrt{41}}{4}$ <p>used a table to get points!</p> |  |

| | | | |
|--|---|---|----------------------|
| $4x = -4x^2 - 1$ $4x^2 + 4x + 1 = 0$ $a=4 \quad b=4 \quad c=1$ $(4)^2 - 4(4)(1)$ 0 | $4x^2 + 4x + 1 = 0$ $a=4 \quad b=4 \quad c=1$ $(4)^2 - 4(4)(1)$ 0 <p>1 REAL RATIONAL SOLUTION</p> | <p>Factor or zero.</p> $(4x^2 + 4x + 2x + 1)$ $2x(2x+1) + (2x+1) = 0$ $(2x+1)(2x+1) = 0$ $x = -1/2$ | |
| $3x^2 + 4x - 6 = x - 27$ $-x + 27 - x - 27$ | $3x^2 + 3x + 21 = 0$ $a=3 \quad b=3 \quad c=21$ $(3)^2 - 4(3)(21)$ -243 <p>NO REAL SOLUTIONS</p> | <p>NO SOLUTIONS!</p> | <p>not to scale!</p> |

Give an example of an equation that will have 2 real rational solutions

Give an example of a graph that will have no solutions

Give an example of an equation that will have exactly one zero

Give an example of a graph that will have 2 irrational solutions