

For questions 11 – 15, decide if the statement is *true* or *false*. If true, explain your reasoning. If false, explain your reasoning or provide a counterexample.

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- This statement is true.

Discriminant: $b^2 - 4ac \geq 0$, then two real roots.

- Two (-) = +

$a = (+)$ $c = (-)$, then Discriminant can be rewritten as $b^2 + 4ac$

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True, The equation
for the discriminant is $b^2 - 4ac$. ~~B^2~~

Can never be negative because a negative squared is always positive. Since either a or c has to be negative, the value of the discriminant is going to be greater than b^2 because a negative times a negative is a positive. Therefore the discriminant is going to be greater than 0, resulting

in two
real
roots.

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True.

Both these are true because the y-intercept is always on the opposite of the x-axis.

\rightarrow a is concave up. If the y-intercept is negative, it has to cross the x-axis at least twice. Before and after c .

\rightarrow a is concave down. If the y-intercept is positive, it must cross the x-axis at least twice. Before and after c .

At the vertex of the equation, they must connect those points, therefore crossing the x-axis are creating a "u". The other root is found on the "reflecting" side.

15. A quadratic equation $ax^2 + bx + c = 0$ where a, b , and c are integers will always have two real roots if a and c have opposite signs.

True, because if a is positive and c is negative, that means it's concave up, with a y-intercept that's negative, so the vertex is below x-axis, so have 2 real roots.

If a is negative and c is positive, it is concave down, with a y-intercept that's positive, so vertex is above x-axis, so have 2 real roots.

15. A quadratic equation $ax^2 + bx + c = 0$ where a, b , and c are integers will always have two real roots if a and c have opposite signs.

True

If a is negative, the parabola will be concave down. If c is positive (opposite sign of a), the y intercept of the parabola will be above the x-axis. This forces the parabola, which is already below the x-axis because a is negative, to cross the x-axis to reach its y-intercept, making the parabola have 2 real roots.