“For which values of m does the equation $5x^2-6x+(m+3)=0$ have no real roots?”

Below is my barely executed (and incorrectly at that) initial attempt to find the required values.

$$5x^2-6x+(m+3)<0$$
$$5x^2-6x+m<-3$$

Here, I attempted to solve the problem like a regular inequality, instead of the quadratic equation-specific method. This method is derived from the quadratic formula below.

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

The quadratic formula is used for finding both solutions in polynomials with two roots (solutions) in the form ax^2+bx+c, such as the above $5x^2-6x+(m+3)$. The part we want to use is the one inside the square root symbol, b^2-4ac. We convert this into $b^2-4ac < 0$ to find the values where the roots are not real (ie: impossible or non-existent). If we wanted the values where the roots were equal or otherwise real, we would use an = or > sign instead of <.

From here, we plug in the polynomial terms (numbers separated by signs) of $5x^2-6x+(m+3)$ into $b^2-4ac < 0$ based on whether they correspond to a, b, or c in ax^2+bx+c. (m+3) is considered one term because of its brackets.

$$(-6)^2 - 4(5)(m+3) < 0$$

$$36 - 4(5m + 15)$$

$$36 - 20m - 60 < 0$$

$$-20m < 24$$

$$m > -\frac{5}{6}$$

This is the properly completed version of the problem, after plugging in the terms. From there, it is simple to solve the inequality by simplifying the left side of the equation, then isolating the m variable by subtracting 36 and adding 60 to both sides of the inequality. From there, we divide the right side of the inequality by m’s coefficient, -20. One should be careful to remember to flip the inequality sign when this is done. This leads to the conclusion that for the equation to have a non-real root, m must be less than $-\frac{5}{6}$.