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$$\begin{array}{l} a = 3 \\ b = -2 \\ c = k \end{array}$$
$$b^2 - 4ac < 0$$
$$(-2)^2 - 4(3)k < 0$$
$$4 - 12k < 0$$
$$\frac{-12k < -4}{k > \frac{1}{3}}$$

23. Find all values of  $k$  such that the equation  $3x^2 - 2x + k = 0$  has imaginary roots.

if  $b^2 - 4ac < 0$ , then it will give you  
imaginary roots  
 $\rightarrow k=c$  in this case.

$$3x^2 - 2x + k = 0 \quad a = 3$$
$$b = -2$$
$$c = k$$

$$b^2 - 4ac < 0$$
$$(-2)^2 - 4(3)(k) < 0$$

$$\frac{4}{-4} - 12(k) < 0$$
$$\frac{-4}{-4}$$

$$\frac{-12k < -4}{-12} \frac{-12}{-12}$$

$$\frac{k > \frac{-4}{-12}}{}$$

$$\boxed{k > \frac{-1}{-3}}$$

or

$$k > \frac{1}{3}$$

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I graphed the equation on my calculator, and found that the minimum of  $3x^2 - 2x$  is  $\frac{1}{3}$ . I then entered the equation  $3x^2 - 2x + \left(\frac{1}{3}\right)$  and got the minimum as 0. This means that when  $k$  is above  $\frac{1}{3}$ , the roots are imaginary and when it is equal to  $\frac{1}{3}$ , the equation is tangent to the  $x$ -axis.