

## IIT Madras ONLINE DEGREE

## Mathematics for Data Science -1 Week 07 - Tutorial 07

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7. Given that p(x) = \frac{|x^2 + kx + 4|}{|x - 5|} \frac{|x - 3|}{|x - 3|}, and K is the set of values of K. Choose only on the correct option if p(x) always have four real roots.

A. K = \{z | z \in (-\infty, -4] \cup [4, \infty)\}
B. K = \{z | z \in (-\infty, -4) \cap (4, \infty)\}
C. K = \{z | z \in (-\infty, -5.8) \cup (-5.8, -\frac{52}{12}) \cup (-\frac{52}{12}, -4) \cup (4, \infty)\}
D. None of the above.

5 , 3

K^2 - 16 \ge 0
K^2 > 16
K = \{x | x \in (-\infty, -5.8) \cup (-5.8, -\frac{52}{12}) \cup (-\frac{52}{12}, -4) \cup (4, \infty)\}
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In this question, we are given a polynomial p(x) which is a product of a quadratic with a monomial and another monomial. And the quadratic has some variable k in it, capital K is the set of values of this small k, choose a correct option if p(x) always has 4 real roots but they need not be distinct and we already know that 5 and 3 are roots because of these two monomials. So, what is remaining is that our quadratic equation also should have roots.

And for that the discriminant which is  $k^2 - 16$  should be  $\ge 0$ . That would indicate  $k^2 \ge 16$ , thus k, the magnitude of  $k \ge 4$ . If  $k \ge 4$  you get a repeated root you get the same root twice, so what corresponds which option corresponds to this is a because you go from  $-\infty$  to -4 and then 4 to  $+\infty$  and their union and 4 and -4 are with closed intervals therefore, they are included.