



# **Signs of quadratic function**

## **Part 5**

**In the previous videos, We've learned how to solve a parametric equation of second degree.**

**In this part, we will learn about parametric example on the signs of roots of a quadratic function.**

# Parametric example

Consider the quadratic function:

$$f(x) = (m + 2)x^2 - 2(m + 3)x + m \quad ; \quad m \neq -2$$

You think it is hard!!!

If you follow the given steps, you will find it easy.



# Parametric example

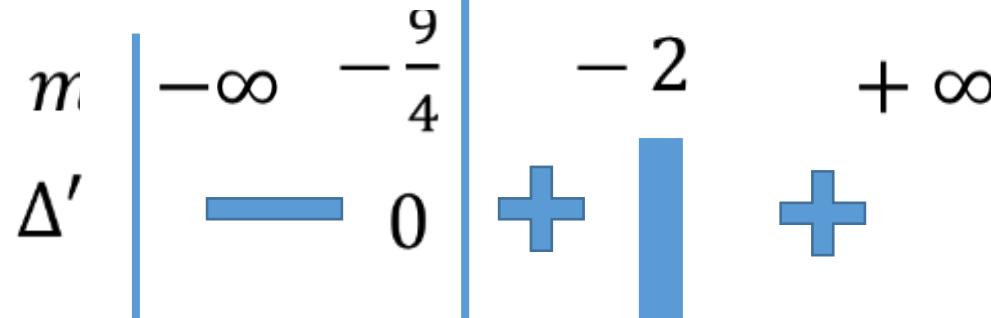
Step 1 Calculate the discriminant  $\Delta$  (or  $\Delta'$ ) and study its signs

$$f(x) = (m+2)x^2 - 2(m+3)x + m \quad ; \quad m \neq -2$$

$$a = m+2 \quad ; \quad b = -2(m+3) \quad ; \quad c = m$$

$$\begin{aligned}\Delta' &= b'^2 - ac = (m+3)^2 - (m+2)(m) \\ &= m^2 + 6m + 9 - m^2 - 2m = 4m + 9\end{aligned}$$

$$\begin{aligned}\Delta' &= 0 \\ 4m + 9 &= 0 \\ m &= -\frac{9}{4}\end{aligned}$$

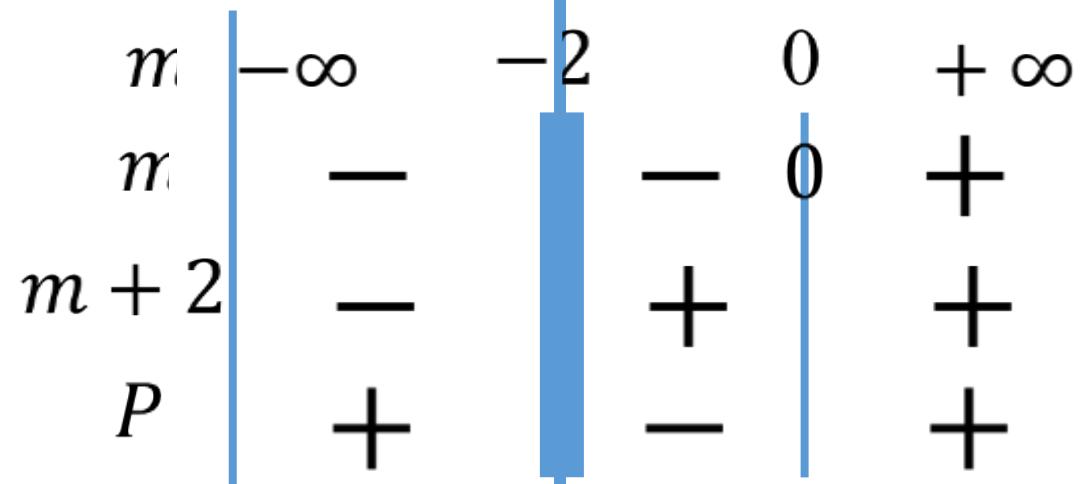


# Parametric example

**Step 2 Calculate the product P and study its signs**

$$a = m + 2 ; \quad b = -2(m + 3) ; \quad c = m$$

$$P = \frac{c}{a} = \frac{m}{m + 2}$$



# Parametric example

## Step 3 Calculate the Sum S and study its signs

$$a = m + 2 ; \quad b = -2(m + 3) ; \quad c = m$$

$$P = \frac{-b}{a} = \frac{2(m + 3)}{m + 2}$$

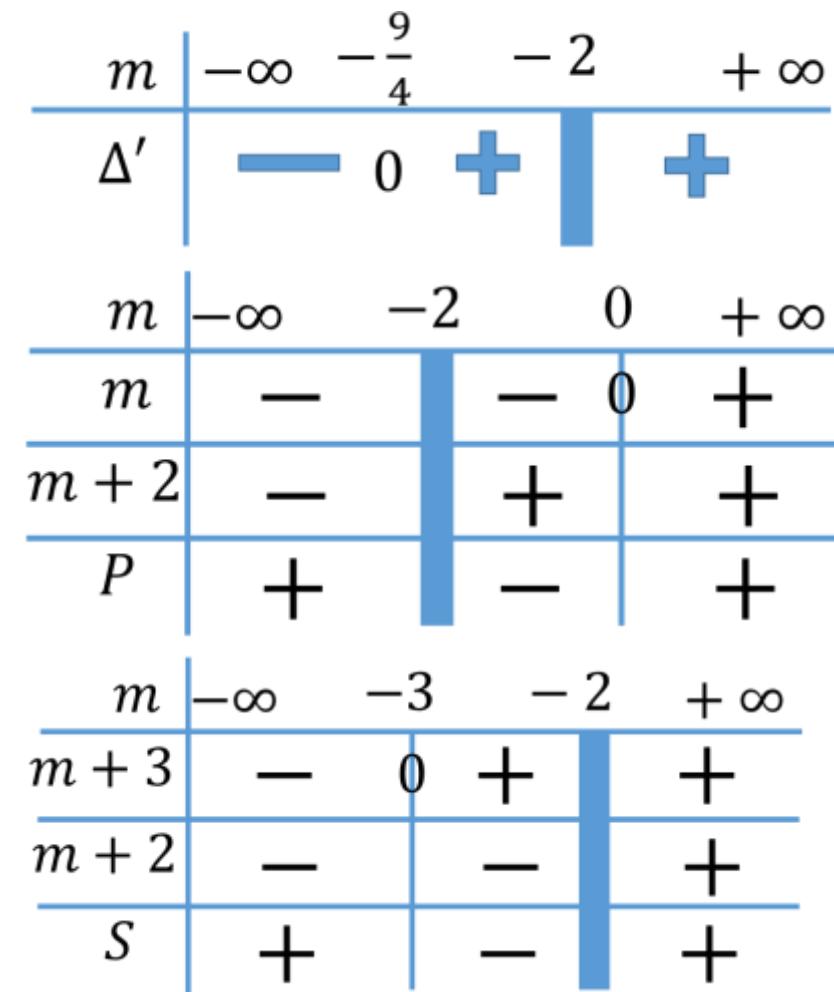
$m$	$-\infty$	-3	-2	$+\infty$
$m + 3$	-	0	+	+
$m + 2$	-	-	-	+
$S$	+	-	-	+

# Parametric example

Step 4

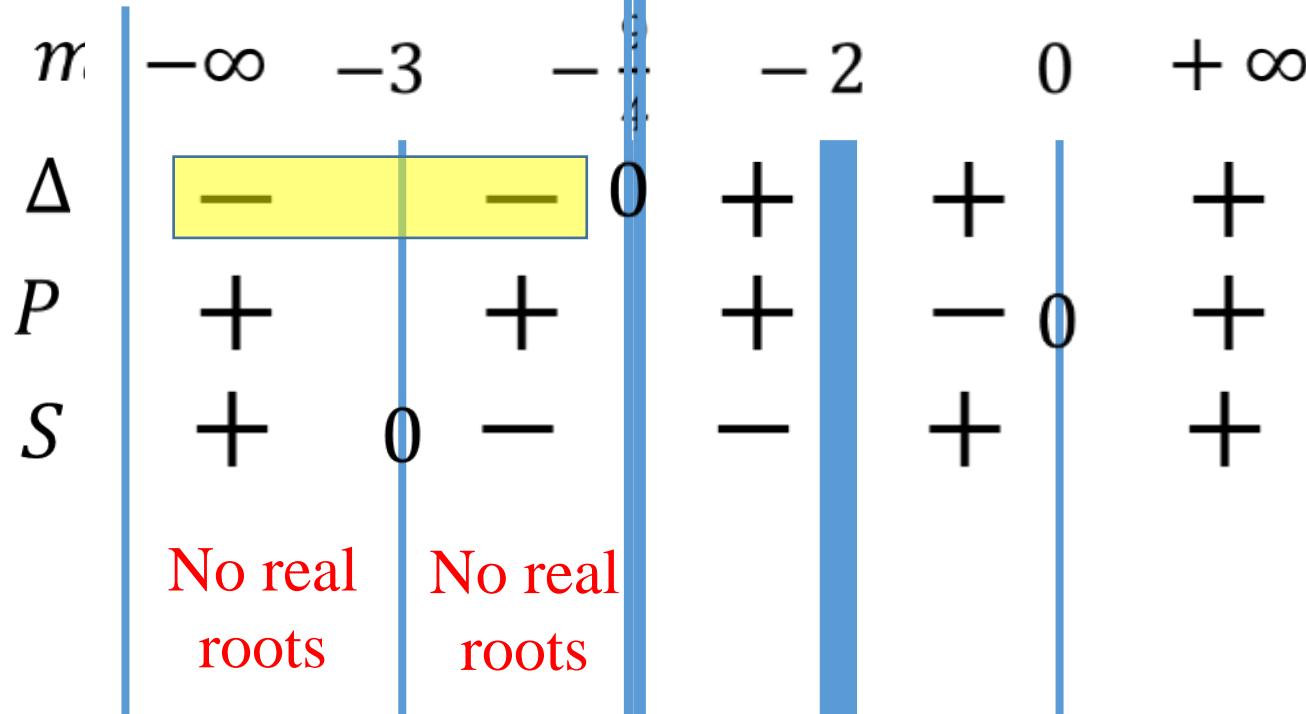
Draw a general table that summarized all the signs studied before

	$m$	$-\infty$	-3	-	-2	0	$+\infty$
	$n$						
$\Delta$		-	-	0	+	+	+
$P$		+	+	+	+	0	+
$S$		+	0	-	-	+	+



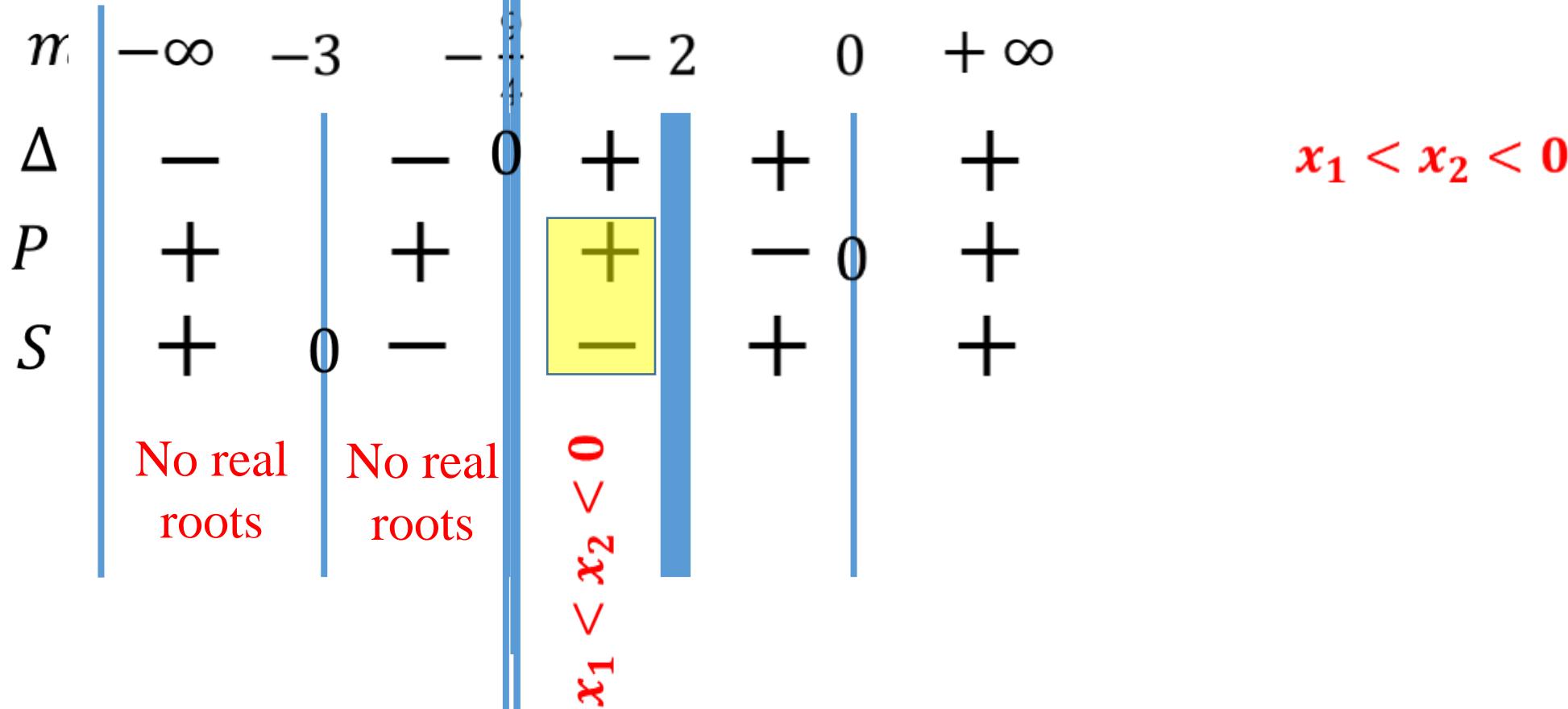
# Parametric example

## Step 5 Discuss



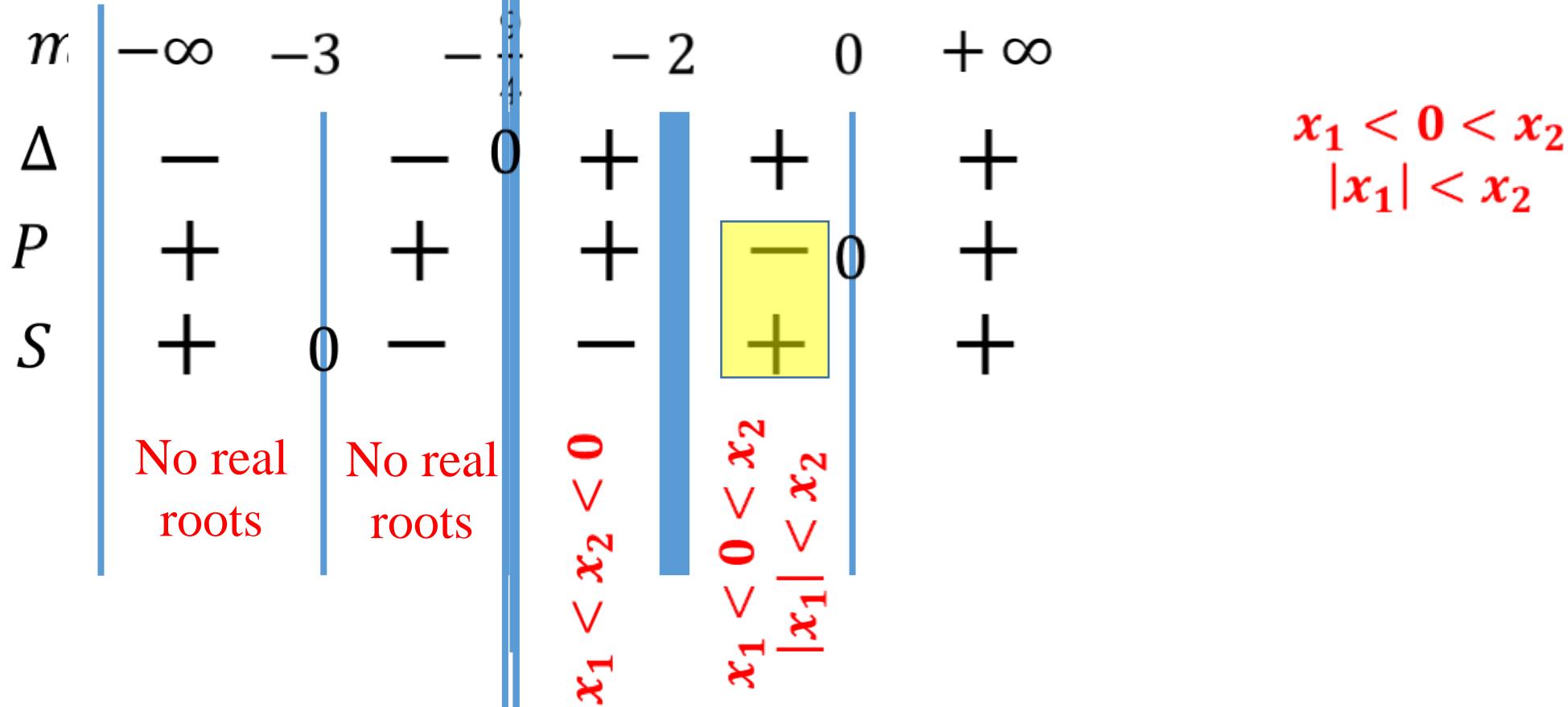
# Parametric example

## Step 5 Discuss



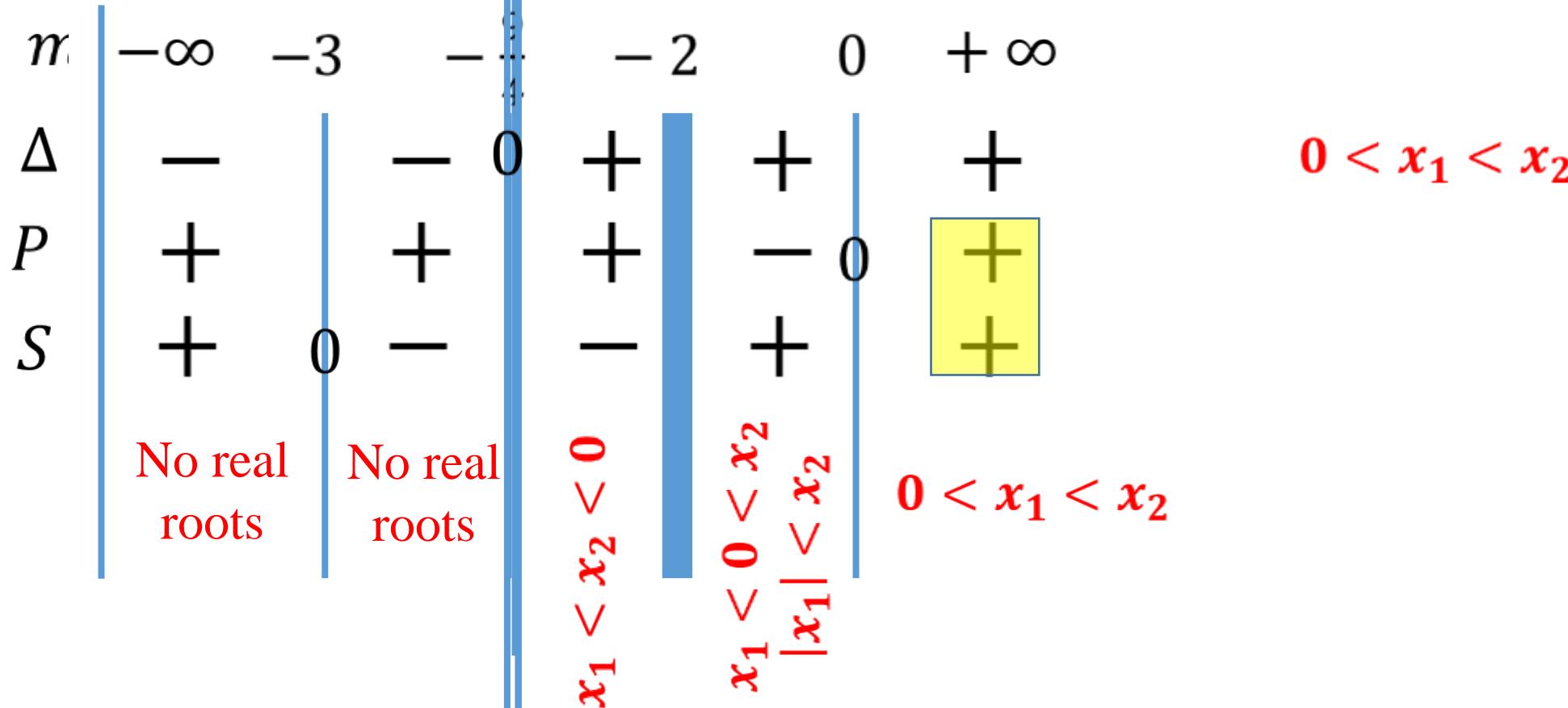
# Parametric example

## Step 5 Discuss



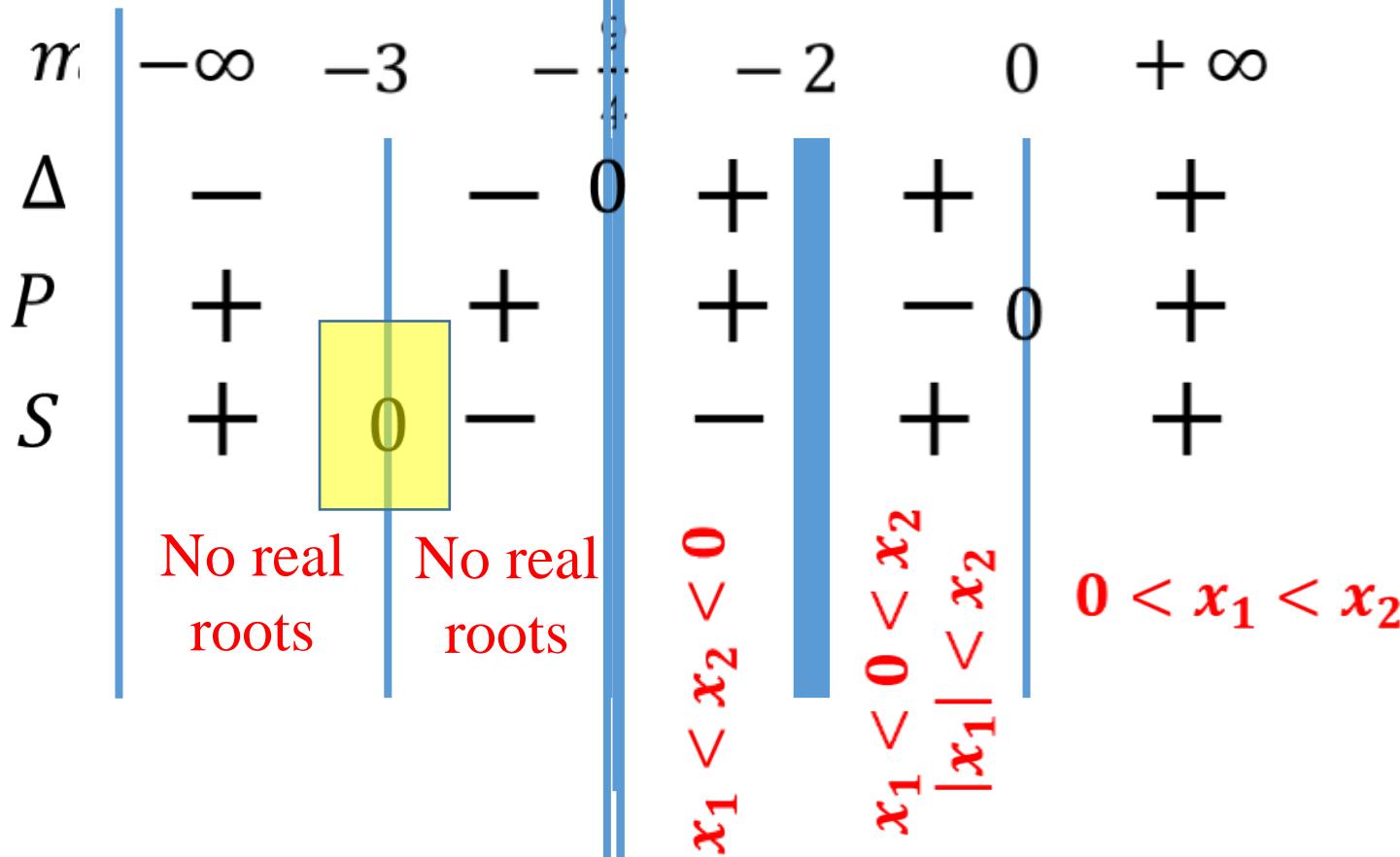
# Parametric example

## Step 5 Discuss



# Parametric example

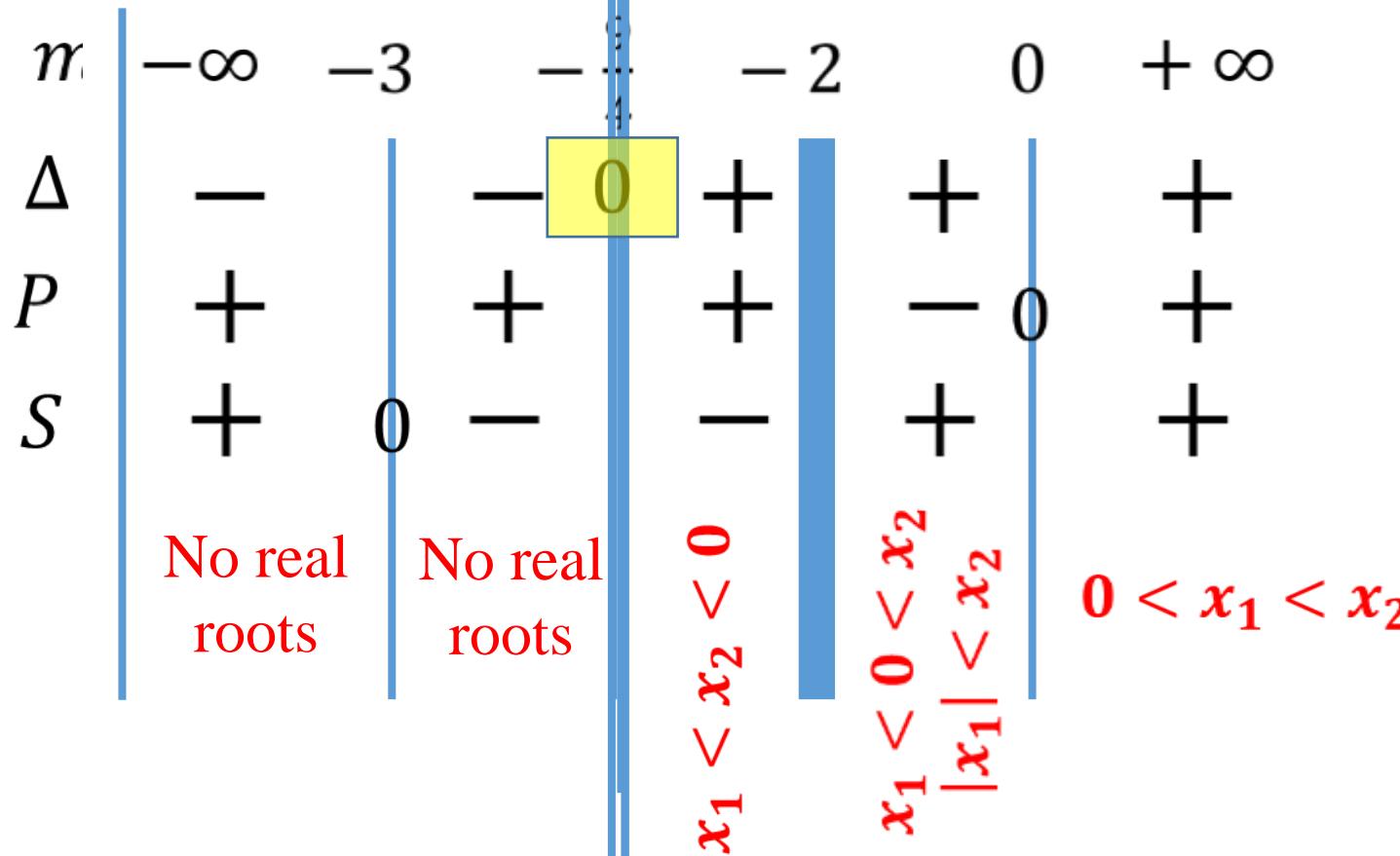
## Step 5 Discuss



- ❖ For  $m = -3$ : the equation is reduced to  $-x^2 - 3 = 0$   
 $x^2 + 3 = 0$   
 So no real roots

# Parametric example

## Step 5 Discuss



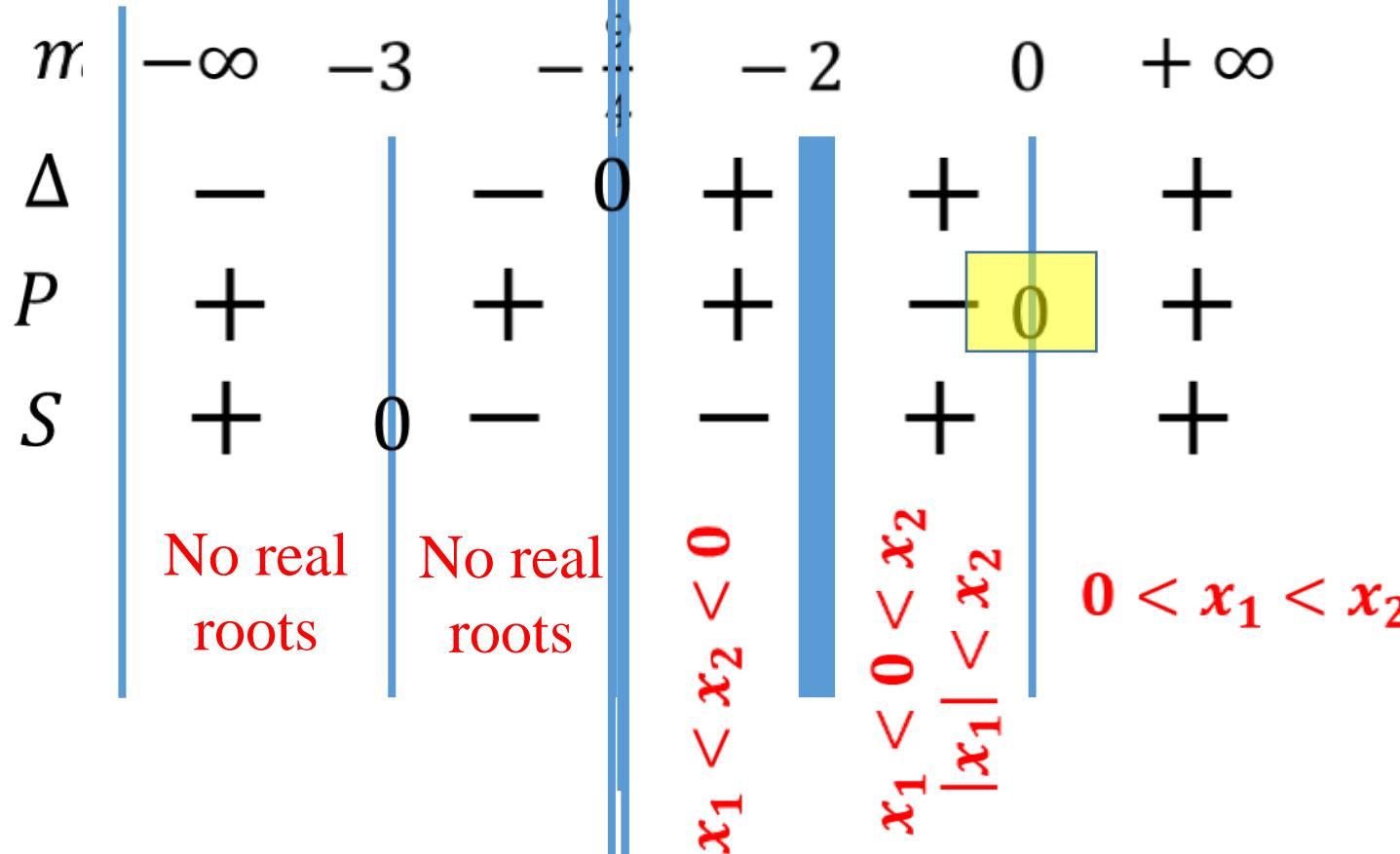
❖ For  $m = -3$ : the equation is reduced to  $-x^2 - 3 = 0$   
 $x^2 + 3 = 0$

So no real roots

❖ For  $m = -\frac{9}{4}$ :  $\Delta' = 0$   
 $\text{So } x_1 = x_2 = -\frac{b}{2a} = -3$

# Parametric example

## Step 5 Discuss



❖ For  $m = -3$ : the equation is reduced to  $-x^2 - 3 = 0$   
 $x^2 + 3 = 0$

So no real roots

❖ For  $m = -\frac{9}{4}$ :  $\Delta' = 0$   
 $So x_1 = x_2 = -\frac{b}{2a} = -3$

❖ For  $m = 0$ :  $P = 0$   
 $So x_1 = 0 ; x_2 = -\frac{b}{a} = +3$

Finally, is it still  
hard to discuss?



