

Example 2

Find the range of values of k for which the equation $x^2 + (k-4)x + (k-1) = 0$ has real roots.

$$\Delta = b^2 - 4ac \geq 0$$

discriminant not negative

$$a = 1$$

$$b = k-4$$

$$c = k-1$$

inside
or outside?



$$\begin{aligned} \Delta &= (k-4)^2 - 4(1)(k-1) \\ &= k^2 - 8k + 16 - 4k + 4 \\ \Delta &= k^2 - 12k + 20 \geq 0 \end{aligned}$$

what if $k^2 - 12k + 20 = 0$

$$(k-2)(k-10) = 0$$

$k = 2$ or $k = 10$

zero test: is $f(0) = (0)^2 - 12(0) + 20 \geq 0$
yes! \Rightarrow outside works

$$2 \leq x \leq 10$$

2. Rational inequalities**Example 3**

Find the range of values of x for which $\frac{2x+1}{x+2} < \frac{1}{2}$.

$$(x+2)^2 \geq 0$$

not negative

multiply by $2(x+2)^2$

$$-x^2 - 4x$$

what if

inside or
outside?

$$\begin{aligned} 2(2x+1)(x+2) &< (x+2)^2 \\ (4x+2)(x+2) &< x^2 + 4x + 4 \\ 4x^2 + 8x + 2x + 4 &< x^2 + 4x + 4 \end{aligned}$$

$$f(x) = 3x^2 + 6x < 0$$

$$\begin{aligned} 3x^2 + 6x = 0 &\Rightarrow x^2 + 2x = 0 \\ &\Rightarrow x(x+2) = 0 \\ &\Rightarrow x = 0, \quad x = -2 \end{aligned}$$

zero test $f(0) = 3(0)^2 + 6(0) < 0$ no
 $f(1) = 3(1)^2 + 6(1) < 0$ no
 \Rightarrow outside down-work

$$-2 < x < 0$$

3. Find the set of values of x for which

(i) $6x^2 - x > 15$

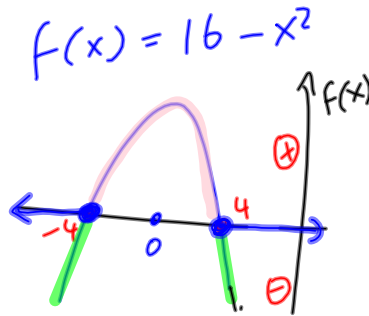
(ii) $16 - x^2 \leq 0$

(iii) $2(x^2 - 6) \geq 5x$.

What if $16 - x^2 = 0$

$(4 - x)(4 + x) = 0$ $x = -4$ or $x = 4$

INSIDE ?
or OUTSIDE



Zero test
 $f(0) = 16 - (0)^2$
 $= 16 \leq 0$ X no
 \Rightarrow Inside doesn't work
 \Rightarrow Values outside

$-4 \geq x \geq 4$