5. For what value(s) of k does each of the following equations have equal roots?

(i) $x^2 - 10x + k = 0$ (ii) $4x^2 + kx + 9 = 0$ (iii) $x^2 - x(2k + 2) + 5k + 1 = 0$

If real $\Delta \geq 0$

$b^2 - 4ac \geq 0$

$a = 1$

$b = -(2k+2)$

$b = -2k-2$

$c = 5k+1$

$\Rightarrow \quad (-2k-2)^2 - 4(1)(5k+1) \geq 0$

$a^2 + 2ab + b^2$

$4k^2 + 8k + 4 - 20k - 4 \geq 0$

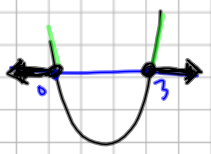
$4k^2 - 12k \geq 0$ * QUADRATIC INEQUALITY CH. 7

$k^2 - 3k \geq 0$

$k(k-3) \geq 0$

If $k(k-3) = 0$

$k = 0$, $k = 3$



$0 \leq k \leq 3$ inside

$0 \geq k \geq 3$ outside

8. Show that the roots of the equation $x^2 - 3x + 2 - c^2 = 0$ are real for all values of $c \in R$.

Real roots $\Rightarrow$

$\Delta \geq 0$

$b^2 - 4ac \geq 0$

$a = 1$

$b = -3$

$c = 2 - c^2$

$\Rightarrow \quad (-3)^2 - 4(1)(2-c^2) \geq 0$

$9 - 8 + 4c^2 \geq 0$

$1 + 4c^2 \geq 0$ * QUADRATIC INEQUALITY CH. 7

$4c^2 \geq -1$

$c^2 \geq -\frac{1}{4}$

which is true