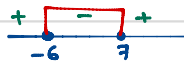


# MISCELLANEOUS EXERCISE 5

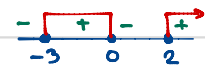
1.  $x^2 - x - 42 \leq 0$   
 $(x-7)(x+6) \leq 0$   
 zV:  $x = -6, 7$



$-6 \leq x \leq 7$

$(x - \frac{1}{2})^2 - \frac{1}{4} - 42 \leq 0$   
 $(x - \frac{1}{2})^2 \leq \frac{169}{4}$   
 $-\frac{13}{2} \leq x - \frac{1}{2} \leq \frac{13}{2}$   
 $-6 \leq x \leq 7$

5.  $x^3 \geq 6x - x^2$   
 $x^3 + x^2 - 6x \geq 0$   
 $x(x^2 + x - 6) \geq 0$   
 $x(x-2)(x+3) \geq 0$   
 zV:  $x = -3, 0, 2$



$\therefore -3 \leq x \leq 0$  or  $x \geq 2$

2.  $(x+1)^2 < 9$   
 $-3 < x+1 < 3$   
 $-4 < x < 2$

3.  $y = 4x + k$   
 $y = x^2$

$4x + k = x^2$   
 $x^2 - 4x - k = 0$

Doesn't intersect  $\Rightarrow D < 0$

$(-4)^2 - 4(1)(-k) < 0$   
 $16 + 4k < 0$   
 $4k < -16$   
 $k < \underline{-4}$

4.  $x - x^2 < 0$   
 $0 < x^2 - x$   
 $x(x-1) > 0$

zV:  $x = 0, 1$

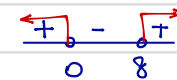


$x < 0$  or  $x > 1$

$(x - \frac{1}{2})^2 - \frac{1}{4} > 0$   
 $x - \frac{1}{2} > \frac{1}{2}$  or  $x - \frac{1}{2} < -\frac{1}{2}$   
 $x > 1$  or  $x < 0$   
          

6a.  $kx^2 + kx + 2 = 0$   
 $D > 0$   
 $D = k^2 - 4k(2) > 0$   
 $k^2 - 8k > 0$   
 $k(k-8) > 0$

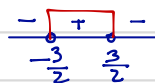
zV:  $k = 0, k = 8$



$k < 0, k > 8$

6b.  $kx^2 + 3x + k = 0$   
 $D = 3^2 - 4k^2 > 0$   
 $9 - 4k^2 > 0$   
 $(3+2k)(3-2k) > 0$

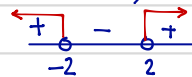
zV:  $k = -\frac{3}{2}, k = \frac{3}{2}$



$-\frac{3}{2} < k < \frac{3}{2}, k \neq 0$

6c.  $x^2 - 2kx + 4 = 0$   
 $D = (-2k)^2 - 4(1)(4) > 0$   
 $4k^2 - 16 > 0$   
 $(2k+4)(2k-4) > 0$

zV:  $k = -2, k = 2$



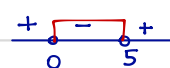
$x < -2, x > 2$

7a.  $kx^2 - 2kx + 5 = 0$   
 $D = (-2k)^2 - 4k(5) < 0$   
 $4k^2 - 20k < 0$

$k^2 - 5k < 0$

$k(k-5) < 0$

zV:  $k = 0, 5$



!  $0 < k < 5$

7b.  $k^2x^2 + 2kx + 1 = 0$   
 $D = (2k)^2 - 4k^2(1) < 0$   
 $4k^2 - 4k^2 < 0$

!  $k \in \emptyset, k = 0$

7c.  $x^2 - 5kx - 2k = 0$   
 $D = (-5k)^2 - 4(1)(-2k) < 0$

$25k^2 + 8k < 0$

$k(25k+8) < 0$

$k = 0, -\frac{8}{25}$

$-\frac{8}{25} < k < 0$

$$8. x^2 + 3kx + k = 0$$

$$D = (3k)^2 - 4(1)(k) \geq 0$$

$$9k^2 - 4k \geq 0$$

$$k(9k - 4) \geq 0$$

$$k = 0, \frac{4}{9}$$



$$k \leq 0 \text{ or } k \geq \frac{4}{9} //$$

$$10. \left. \begin{array}{l} y = \frac{9}{2-x} \\ y = x+k \end{array} \right\} \frac{9}{2-x} = x+k$$

$$g = (2-x)(x+k)$$

$$-x^2 + 2k + 2x - kx = 9$$

$$-x^2 + (2-k)x + 2k - 9 = 0$$

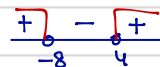
$$D = (2-k)^2 - 4(-1)(2k-9) = 0 > 0$$

$$4 - 4k + k^2 + 8k - 36 > 0$$

$$k^2 + 4k - 32 > 0$$

$$(k+8)(k-4) > 0$$

$$k = -8, 4$$



$$k < -8 \text{ or } k > 4$$

$$9 \left. \begin{array}{l} y = kx - 4 \\ y = x^2 - 2x \end{array} \right\}$$

$$kx - 4 = x^2 - 2x$$

$$x^2 - 2x - kx + 4 = 0$$

$$x^2 - (2+k)x + 4 = 0$$

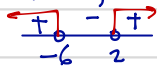
$$D = (2+k)^2 - 4(1)(4) > 0$$

$$4 + 4k + k^2 - 16 > 0$$

$$k^2 + 4k - 12 > 0$$

$$(k+6)(k-2) > 0$$

$$k = -6, 2$$



$$k < -6 \text{ or } k > 2 //$$

$$11 \text{ i } 4x^2 - 12x$$

$$= 4(x^2 - 3x)$$

$$= 4 \left[ \left(x - \frac{3}{2}\right)^2 - \frac{9}{4} \right]$$

$$= 4 \left(x - \frac{3}{2}\right)^2 - 9$$

$$= [2\left(x - \frac{3}{2}\right)]^2 - 9$$

$$= (2x-3)^2 - 9 //$$

11

$$4x^2 - 12x > 7$$

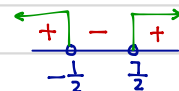
$$(2x-3)^2 - 9 > 7$$

$$(2x-3)^2 - 16 > 0$$

$$(2x-3+4)(2x-3-4) > 0$$

$$(2x+1)(2x-7) > 0$$

$$\text{ZV } x = -\frac{1}{2}, x = \frac{7}{2}$$



$$x < -\frac{1}{2} \text{ or } x > \frac{7}{2} //$$