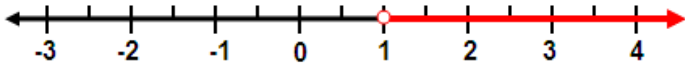


# SOLVING POLYNOMIAL INEQUALITIES – PART 1

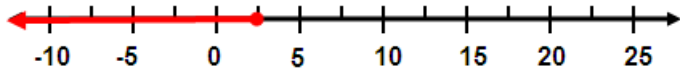
## REPRESENTING INEQUALITIES

Write inequality statements for the values of  $x$  shown on the number lines.

A)  $x > 1$



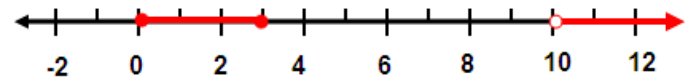
b)  $x \leq 2.5$



c)  $2.5 < x < 6$



d)  $x > 10, 0 \leq x \leq 3$

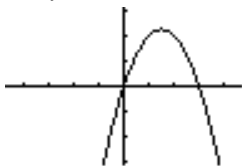


## FIND THE POSITIVE

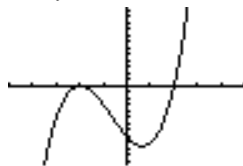
For each graph, write

- i) the  $x$ -intercepts
- ii) the intervals of  $x$  for which the graph is positive
- iii) the intervals of  $x$  for which the graph is negative

a)  $y = -x(x-3)$

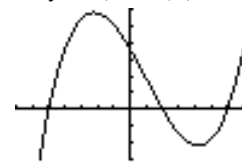


b)  $y = (x+2)^2(x-2)$

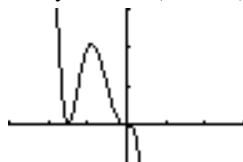


x-intercepts	Positive	Negative	x-intercepts	Positive	Negative
$x = 0, 3$	$0 < x < 3$	$x < 0, x > 3$	$x = -2, 2$	$x > 2$	$x < -2, -2 < x < 2$

c)  $y = (x+5)(x-2)(x-6)$



d)  $y = -x^3(2x+3)^2$



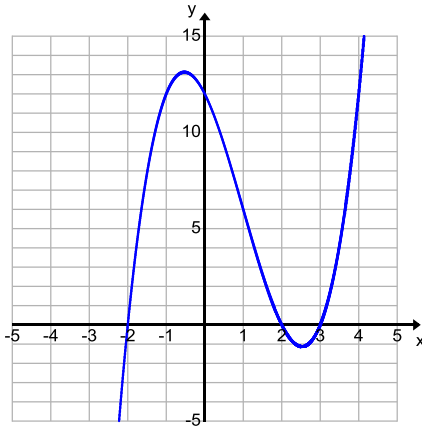
x-intercepts	Positive	Negative	x-intercepts	Positive	Negative
$x = -5, 2, 6$	$-5 < x < 2, x > 6$	$x < -5, 2 < x < 6$	$x = -3/2, 0$	$x < 0$	$x > 0$

- A polynomial inequality results when the equal sign in a polynomial equation is replaced with an inequality symbol ( < or > )
- The real zeros of a polynomial function, or x-intercepts of the corresponding graph, divides the x-axis into intervals that can be used to solve a polynomial inequality.

### Example 1

Solve the inequality graphically by first determining the zeros of the function.

$$x^3 - 3x^2 - 4x + 12 \leq 0$$



ZEROS:  $x = 2, 3, -2$   
Positive Cubic, Y - intercept of 12

$$Y = (x - 2)(x - 3)(x + 2)$$

$$12 = k(0 - 2)(0 - 3)(0 + 2)$$

Where is the function less than or equal to 0?  
(i.e below x-axis)  $x \leq -2, 2 \leq x \leq 3$

Where if the function positive?  
 $-2 \leq x < 2, x > 3$

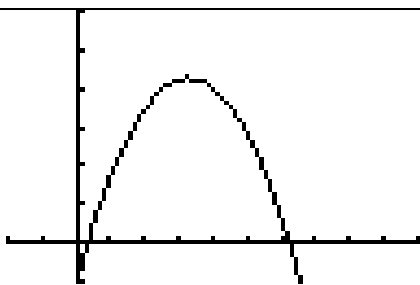
### Example 2

The height,  $h$ , in metres, of a golf ball  $t$  seconds after it is hit can be modeled by the function  $h(t) = -4.9t^2 + 32t + 0.3$ . When is the height of the ball greater than 10 m?

What is the inequality?  $-4.9t^2 + 32t + 0.3 > 10$

#### METHOD 1

- Write the inequality statement and rearrange the equation  $-4.9t^2 + 32t + 0.3 - 10 > 0$   
 $-4.9t^2 + 32t - 9.7 > 0$
- Graph the inequality
- Determine the zeros
- Solve the inequality using the zeros as endpoints



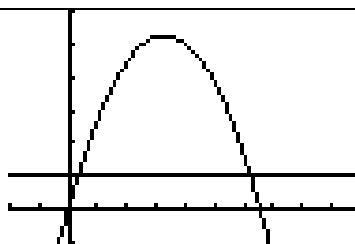
Zeros:  $x = 0.318, 6.24$

$$0.318 < x < 6.24$$

The ball is greater than 10 m high between 0.3 and 6.24 seconds.

#### METHOD 2

- Graph the left side and right side of the inequality as two distinct functions.
- The two functions are equal at their point(s) of intersection. Solve the inequality by finding the points of intersection.



Find the points of intersection of  $h(x)$  and  $y = 10$

At the points of intersection  $x = 0.318, 6.3$

Therefore, The ball is greater than 10 m high between 0.3 and 6.2 seconds.