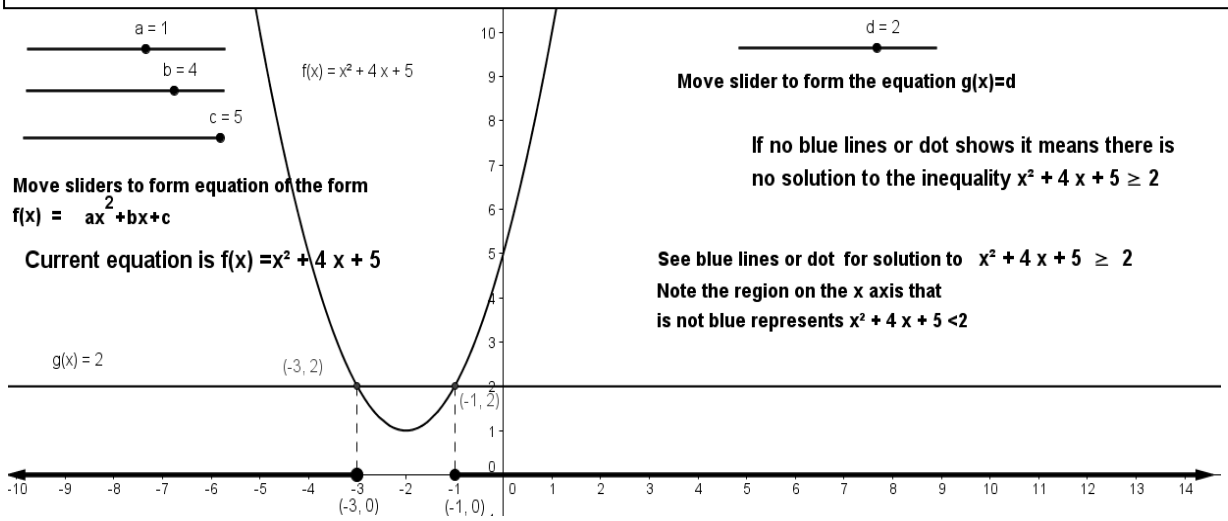
Student Activity: To investigate Quadratic Inequalities

Use in connection with the interactive file, 'Quadratic Inequalities' on the Student's CD.

To explore inequalities of the form f(x) ≤ k, f(x) ≥ k, f(x) < k and f(x) > k,

where f(x) = ax^2+bx+c.



1)

a) Complete the table and draw the graph of $f(x) = x^2+3x+2$.

x	$f(x) = x^2+3x+2$
-3	
-2	
-1	
0	
1	
2	
3	

b) Indicate on the graph and list the points where this graph cuts the x axis. What is the value of f(x) at each of these points?

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c) On the same grid, draw the line g(x) = 2.

d) Indicate on the graph and list the points where is f(x) = g(x). Are these the same points as $x^2+3x+2 = 2$? Explain your answer.

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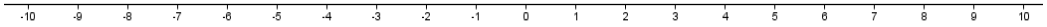
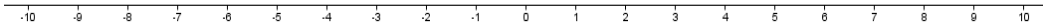
e) Indicate on the number line what the values of x are when:

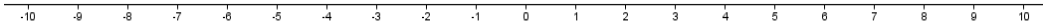
i) $x^2+3x+2 \geq 2$



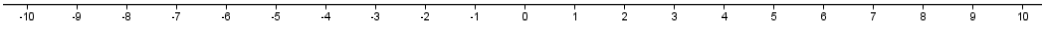
ii) $x^2+3x+2 < 2$



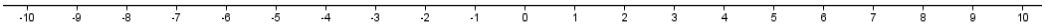
iii) $x^2+3x+2 \leq 2$



iv) $x^2+3x+2 > 2$



v) $x^2+3x+2 =0$



f) Check your answers using the interactive file.

g) In general how do the inequalities f(x) ≤0 and f(x) <0 differ with regard to possible solutions?

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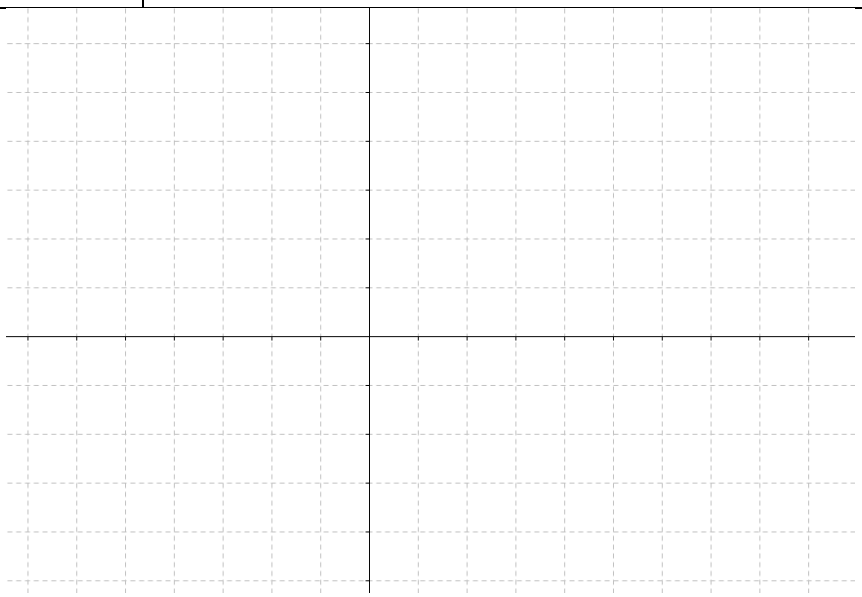
2) Complete the table and draw the graph of $f(x) = -x^2+3x+2$.

x	$f(x) = -x^2+3x+2$
-3	
-2	
-1	
0	
1	
2	
3	



a) Indicate on the graph and list the points where this graph cuts the x axis. What is the value of f(x) at each of these points?

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b) On the same grid, draw the line g(x) = 1.

c) Indicate on the graph and list the points where is f(x) = g(x). Are these the same points as $x^2+3x+2 = 2$? Explain your answer.

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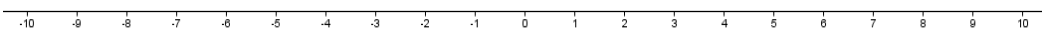
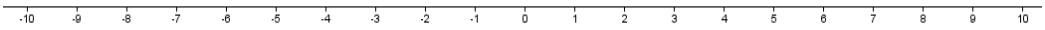
d) Indicate on the number line what the values of x are when:

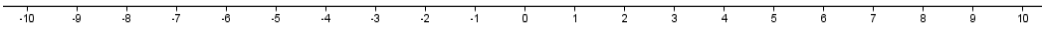
i) $-x^2+3x+2 \leq 1$



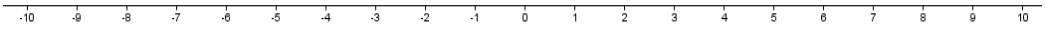
ii) $-x^2+3x+2 \geq 1$



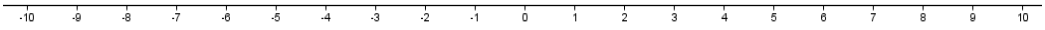
iii) $-x^2+3x+2 < 1$



iv) $-x^2+3x+2 > 1$



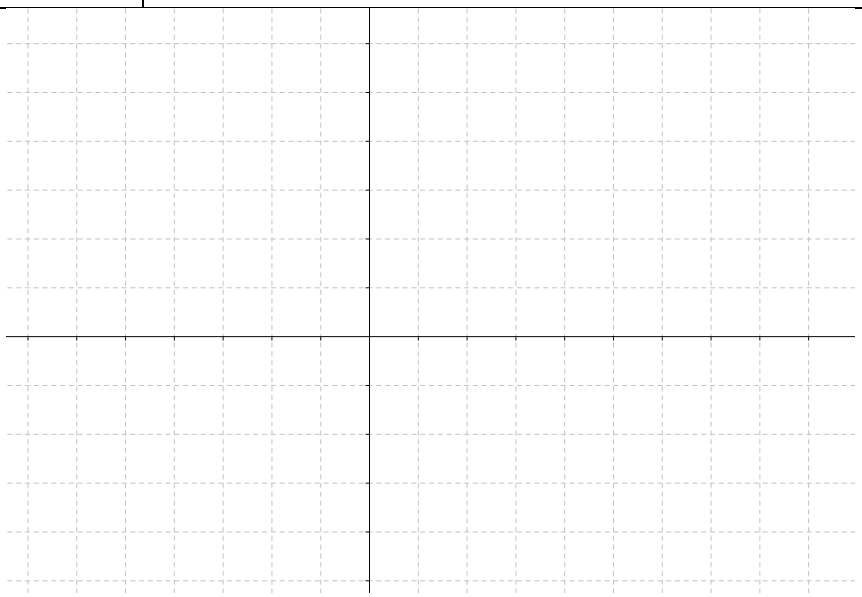
v) $-x^2 + 3x + 2 = 0$



e) Check your answers using the interactive file.

3) Complete the table and draw the graph of $f(x) = x + 3 - x^2$.

x	$f(x) = x + 3 - x^2$
-3	
-2	
-1	
0	
1	
2	
3	



a) Indicate on the graph and list the points where this graph cuts the x axis. What is the value of f(x) at each of these points?

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b) On the same grid, draw the line g(x) = 4.

c) Indicate on the graph and list the points where is f(x) = g(x). Are these the same points as $x^2+3x+2 = 2$? Explain your answer.

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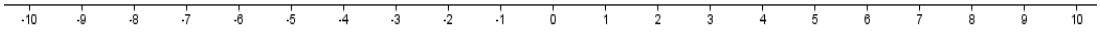
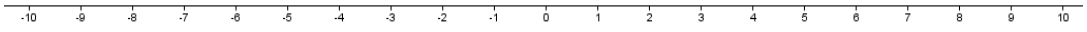
d) Indicate on the number line what the values of x are when:

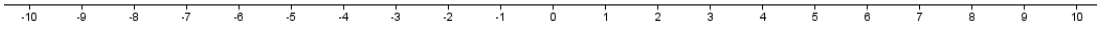
i) $x + 3 - x^2 \geq 4$



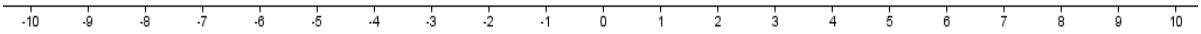
ii) $x + 3 - x^2 < 4$



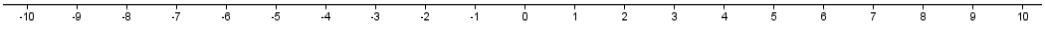
iii) $x + 3 - x^2 \leq 4$



iv) $x + 3 - x^2 > 4$

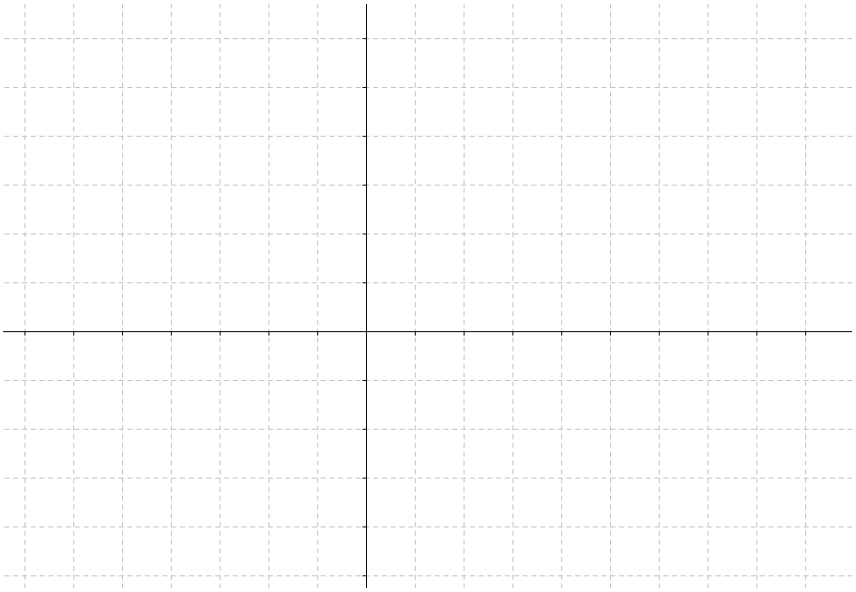


v) $x + 3 - x^2 = 0$



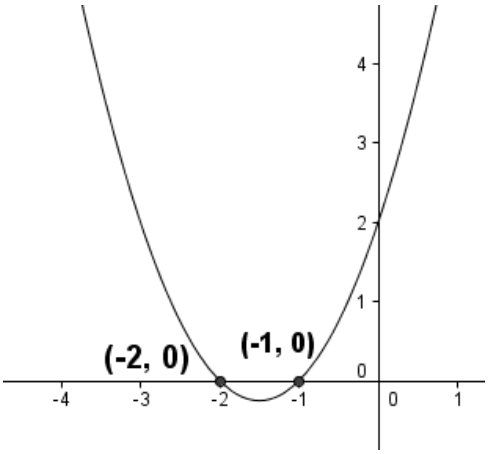
e) Check your answers using the interactive file.

4) Given that f(x) = (x + a) (x + b) cuts the x axis at −a and −b, factorise $x^2+5x+4 = 0$ and represent the inequality $x^2+5x+4 <0$ on a graph.



5)

a) Determine the equation of the function f(x) represented in the diagram below.

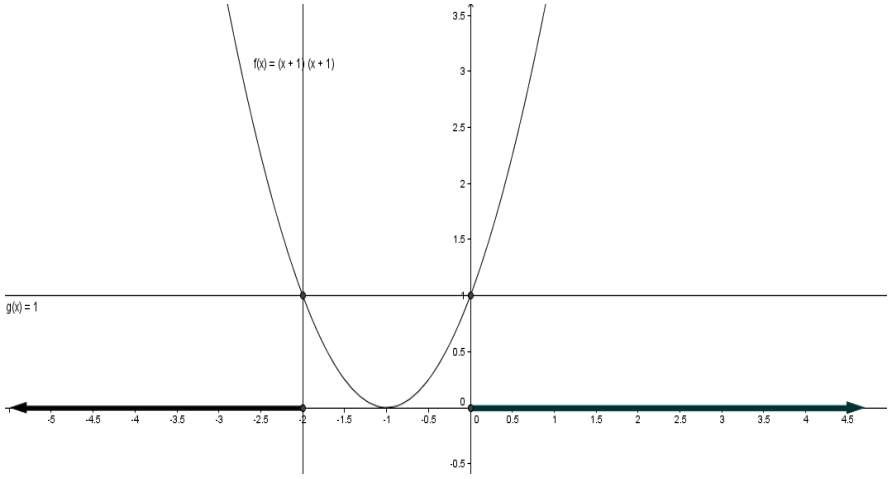


b) In red, indicate on the graph the solution to the inequality f(x) ≤2.

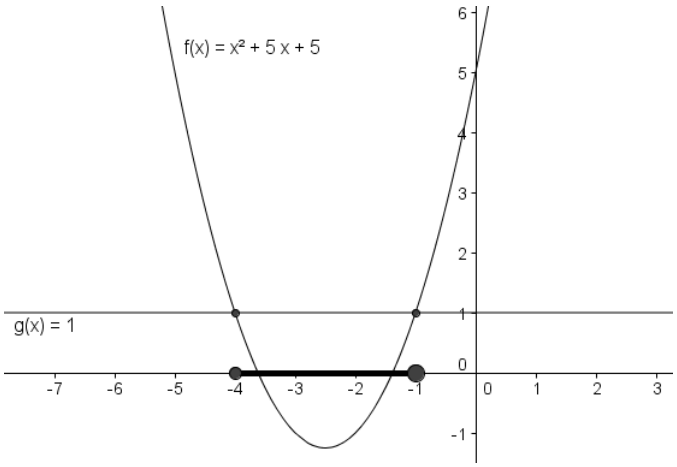
c) In blue, indicate on the graph the solution to the inequality f(x) ≥2.

d) How does the solution to the inequality f(x) < 2 differ from that in question b) above with regard to possible solutions?

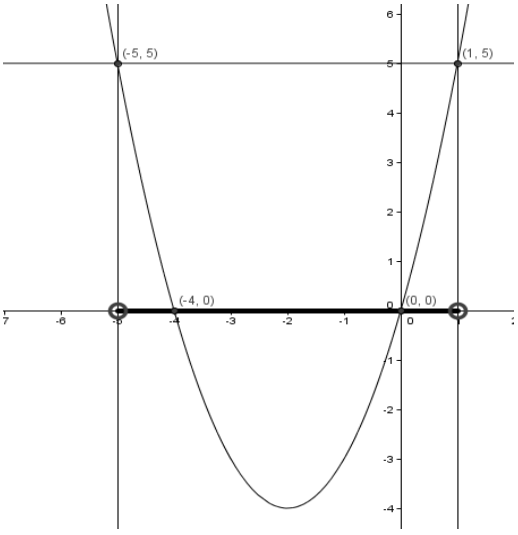
6) In words and mathematically, state what inequality is represented by the thick black lines in the following graph.



7) In words and mathematically, state what inequality is represented by the thick dark black line in the following graph.

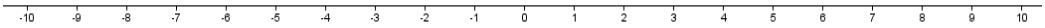


8) In words and mathematically, state what inequality is represented by the thick dark black line in the following graph.

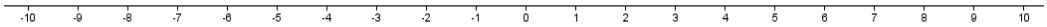


9) Given that $f(x) = x^2 + 2x - 8$, indicate the regions on the number lines which satisfy these inequalities.

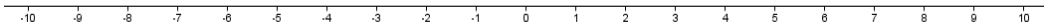
a) $f(x) \geq 0$



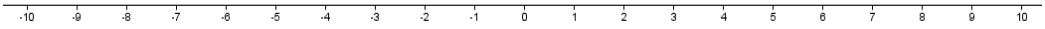
b) $f(x) \leq 0$



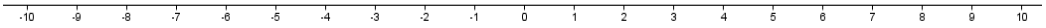
c) $f(x) < 0$



d) $f(x) > 0$



e) $f(x) = 0$



10) Given that f(x) is the quadratic function represented on the graph below and g(x) is the line represented on the graph below, find the solution set to $f(x) \leq g(x)$.