

Interactive I.T. Student Activity Sheets

Leaving Certificate Strand 4



- Student Activities written to match the I.T. interactive modules on the Project Maths Leaving Certificate Student's CD Strand 4
- Interactive Activity Sheets included to enhance students' understanding of mathematical concepts
- Simple and clear guidelines are provided to facilitate learning
- Interesting questions are provided to lead students to explore, construct and consolidate their learning

Preface

The NCCA have pointed out particular Key Skills in their Draft Syllabus. “While particular emphasis is placed in mathematics on the development and use of information processing, logical thinking and problem-solving skills, the new approach being adopted in the teaching and learning of mathematics will also give prominence to students being able to develop their skills in communicating and working with others. By adopting a variety of approaches and strategies for solving problems in mathematics, students will develop their self-confidence and personal effectiveness.” To help our students to adapt to and take advantage of this new spirit of the syllabus, we have produced Interactive I.T. Student Activity Sheets which incorporate an innovative and diversified learning environment for mathematics.

As we all know, the advancement in technology has changed the way we can learn mathematics. Therefore we have developed a number of interactive modules on our student’s CD to match this new development. With the help of these interactive modules, students can not only enhance their understanding in mathematics, but they can also enjoy learning it.

In order to help our students use the I.T. tools more effectively, ***Interactive I.T. Student Activity Sheets Leaving Certificate Strand 4*** are produced in this booklet. A student activity sheet is designed for the majority of the interactive modules on the CD. All student activity sheets provide simple and clear guidelines including:

1. Reference to the related topics in ***Project Maths Student’s Leaving Certificate Strand 4 section***
2. Purpose of the I.T. tools
3. Instructions for using the I.T. tools.

These Student Activity Sheets, which include many interesting questions, will lead students to explore, construct, and consolidate their knowledge of mathematics on their own with ease. We believe that with the help of these activities, students’ knowledge and understanding of mathematics will grow.

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Instructions for use

This booklet contains student activities to accompany the majority of the interactive files on the Leaving Certificate Strand 4 section of the student disk. The specific section of the course that the activity relates to is specified in the name of the activity. At the top of each student activity the students are told what interactive file on the student disk is to accompany the student activity.

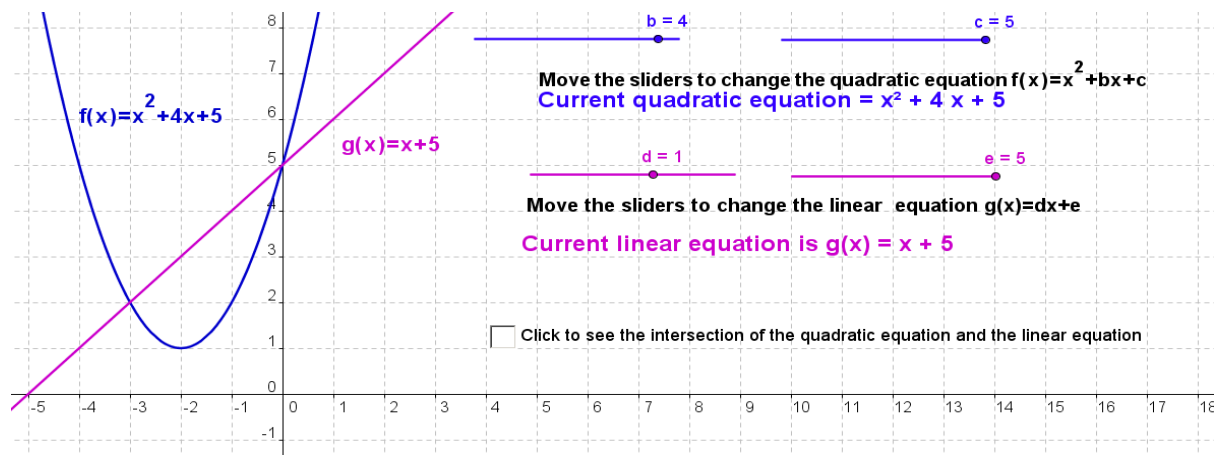
Technical Problems

The student disk has a link situated on the left hand side of its front page called “Troubleshooting” this section gives instructions, if any of the following problems are encountered:

- Problems opening Office 2007 documents
- You do not have Java on your machine
- You do not have a PDF reader on your machine.

Student Activity: To solve a linear and a quadratic equation using tables, graphs and algebraic methods

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



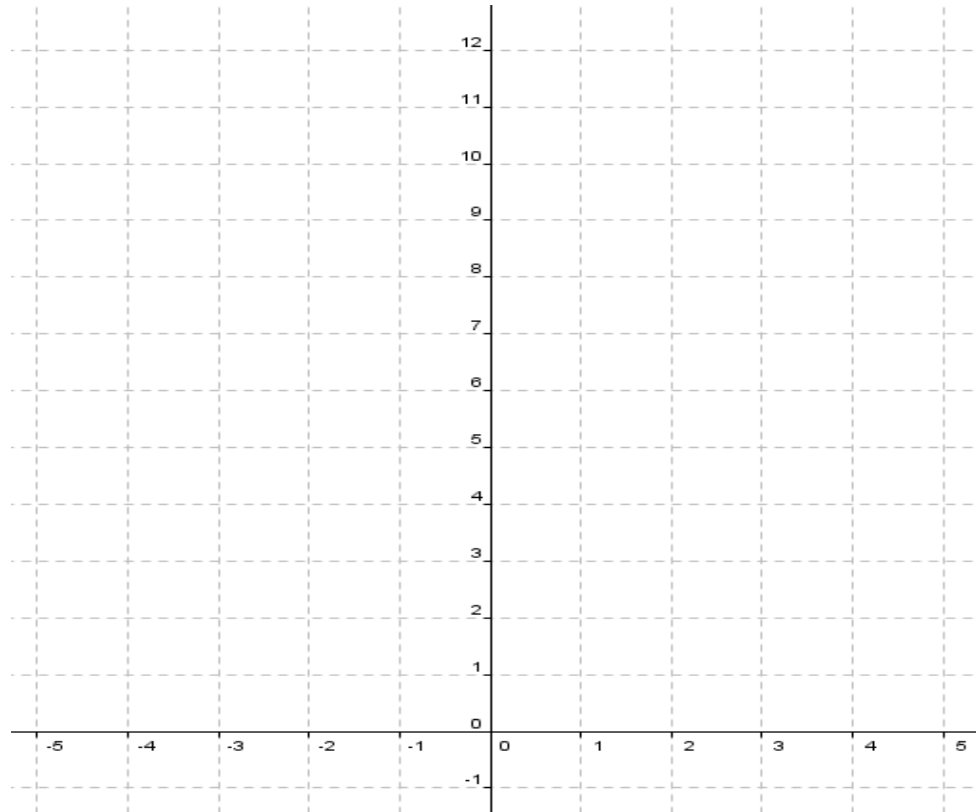
1.

a. Complete the following tables:

x	x^2	$3x$	2	$f(x) = x^2 + 3x + 2$
-4				
-3				
-2				
-1				
0				
1				
2				

x	$g(x) = x + 5$
-3	
-2	
-1	
0	
1	
2	

- b. Use the information obtained in the table above draw a graph of $f(x) = x^2 + 3x + 2$ in the domain $-4 \leq x \leq 2$.



- c. Draw a graph of $g(x) = x + 5$ in the domain $-3 \leq x \leq 2$ using the same axis and scale as $f(x)$ above.

- d. From both of the tables above, are there any value(s) of x for which $f(x) = g(x)$? If so what are these value(s)?

e. From the graph above, are there any value(s) of x for which $f(x) = g(x)$? If so what are these value(s)?

f. Hence list the solution(s) of $f(x) = g(x)$?

g. Solve $f(x) = g(x)$ algebraically.

- h. Did your algebraic solution(s) equal the graphically solution(s)?

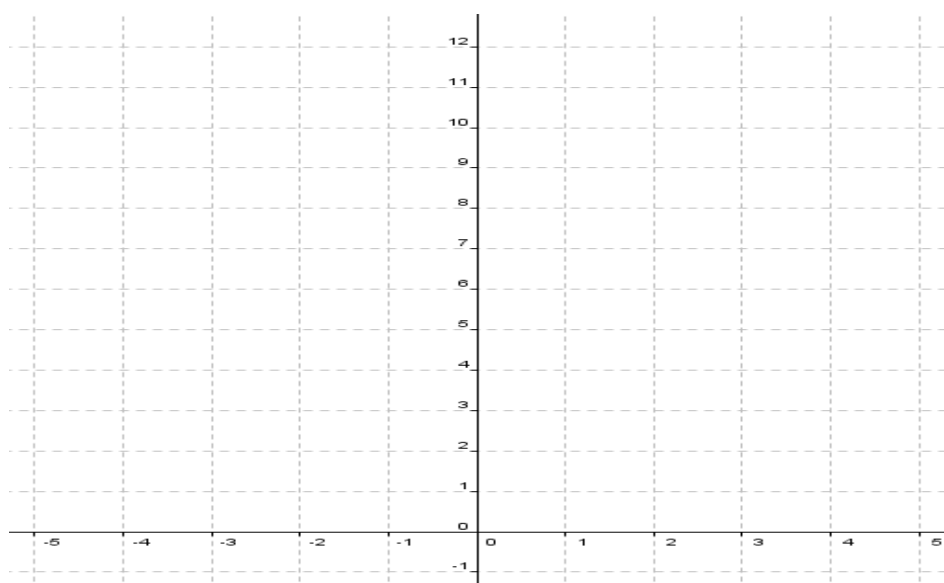
2.

a. Complete the following tables:

x	x^2	$4x$	5	$f(x)=x^2+4x+5$
-4				
-3				
-2				
-1				
0				
1				

x	$g(x) = -x-1$
-4	
-3	
-2	
-1	
0	
1	
2	

b. Use the information obtained in the table above to draw a graph of $f(x) = x^2 + 4x + 5$ in the domain $-4 \leq x \leq 1$.



- c. Draw a graph of $g(x) = -x - 1$ in the domain $-4 \leq x \leq 2$ using the same axis and scale as $f(x)$ above.
- d. From both of the tables above, are there any value(s) of x for which $f(x) = g(x)$? If so what are these values?

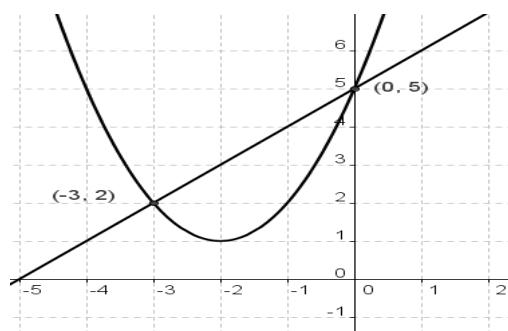
- e. From the graph above, are there any value(s) of x for which $f(x) = g(x)$ and if so what are these value(s)?

- f. Hence what is the solution of $f(x) = g(x)$?

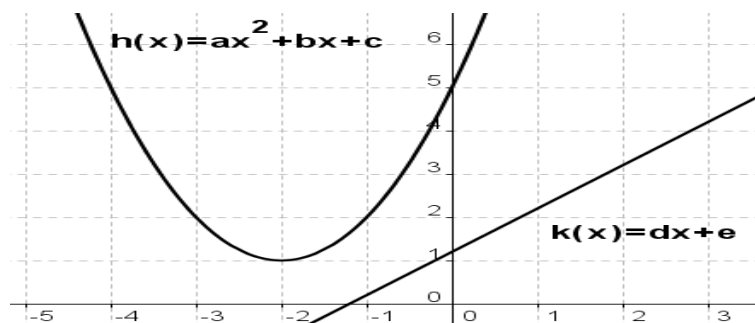
- g. Solve $f(x) = g(x)$ algebraically.

- h. Did your algebraic solution(s) equal the graphical solution(s)?

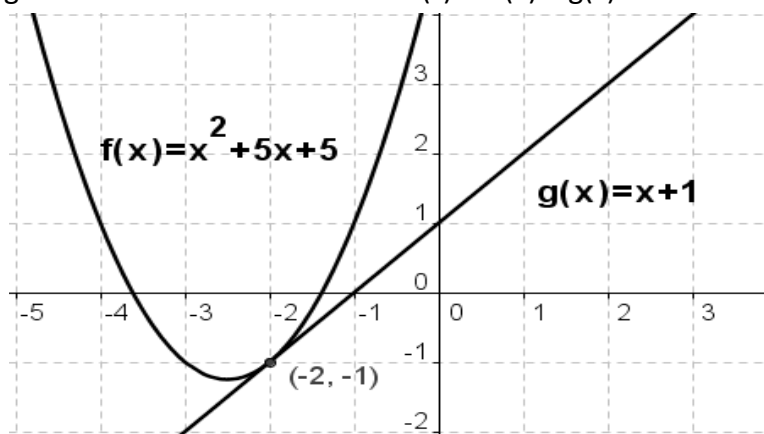
3. Given that the diagram below represents $f(x) = x^2 + bx + c$ and $g(x) = dx + e$, find b , c , d and e .



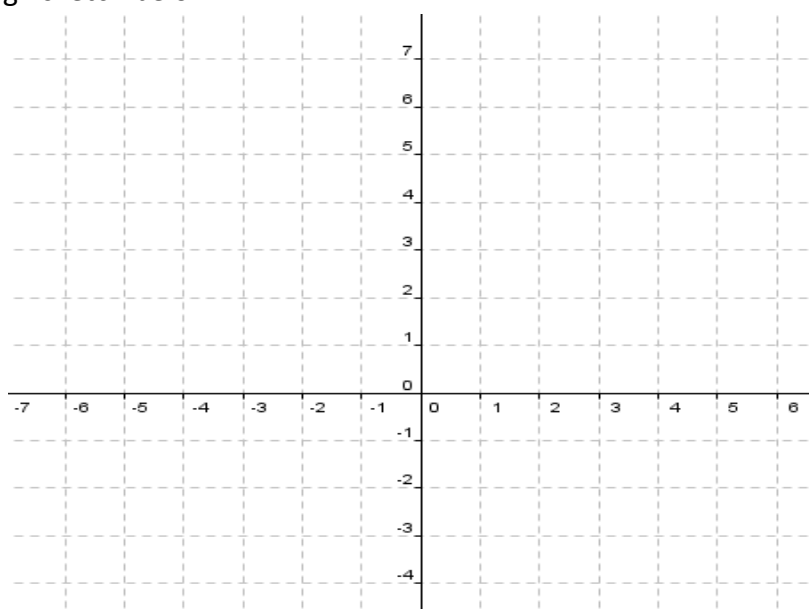
4. Given $h(x) = x^2 + bx + c$ and $k(x) = dx + e$, is there any solution to $f(x) = g(x)$? Explain your answer.



5. From the diagram below what is the solution(s) of $f(x) = g(x)$.



6. Using the interactive file solve $f(x) = g(x)$ where $f(x) = x^2 + 4x + 5$ and $g(x) = -x + 1$. Draw a rough sketch below.



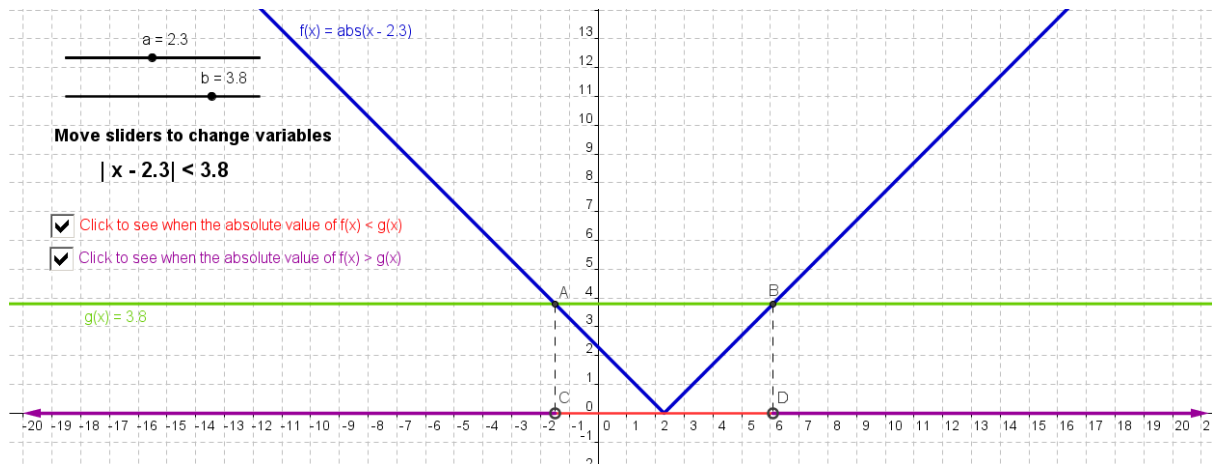
7. Using the information obtained in the above question solve the following set of simultaneous equations $y = x^2 + 4x + 5$ and $x + y - 1 = 0$.

Challenge

8. Given the length of a rectangular kitchen is half the square of its width and its perimeter is 48 m, find the dimensions of the kitchen.

Student Activity: To investigate absolute value

Use in connection with the interactive file, 'Absolute value', on the Student's CD.

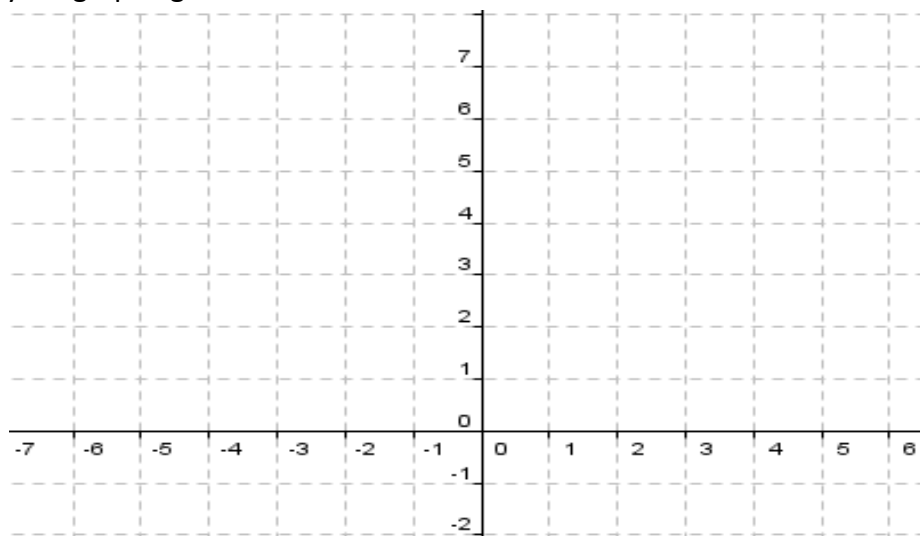


1.

a. Complete the following table:

x	$x - 2$	$ x - 2 $
-5		
-4		
-3		
-2		
-1		
0		
1		
2		
3		

b. Use the information in the above table to draw a graph of $f(x) = |x - 2|$. Check your graph against the interactive file.



- c. On the same diagram draw $g(x) = 3$.
- d. At what points do $f(x)$ and $g(x)$ intersect?
-
- e. Use your graph to determine the values of x for which $|x - 2| < 3$.
-
-
- f. Use your graph to determine the values of x for which $|x - 2| > 3$.
-
-
- g. At the points of intersection of $f(x) = g(x)$, is $|x - 2| > 3$, $|x - 2| < 3$ or $|x - 2| = 3$?
-
-
-
- h. Given $|x| = 5$, is it true that $x=5$ and $-x = 5$? Explain.
-
-
-
- i. Given $|x - 2| < 3$, is it true that $x - 2 < 5$ and $-(x - 2) < 5$?
-
-
-
- j. Solve the 2 inequalities in the above section of the question using algebra.
-
-
-
-

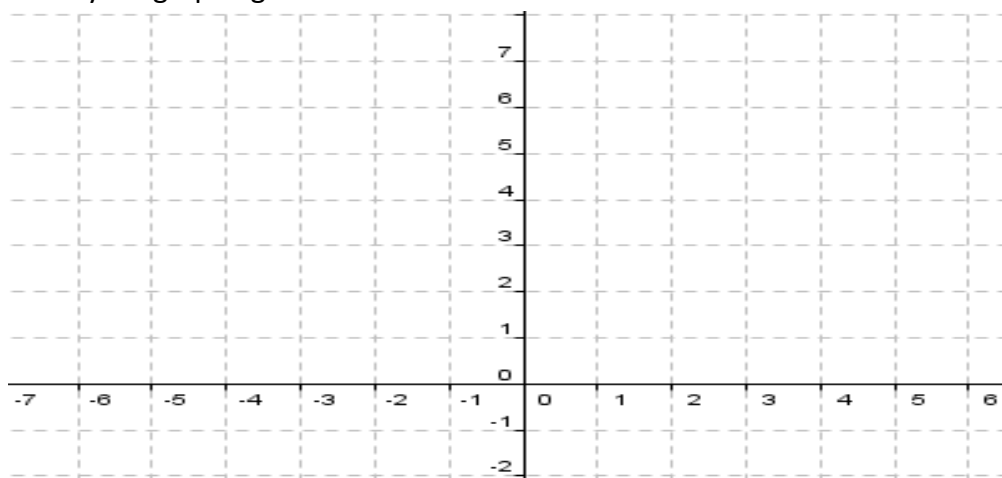
- k. Did the solution you got by algebra agree with the solution you got from the graph above? If not, recheck your work.
-

2.

- a. Complete the following table:

x	$x - \frac{1}{2}$	$\left x - \frac{1}{2} \right $
-5		
-4		
-3		
-2		
-1		
0		
1		
2		
3		

- b. Using the information from the above table, draw a graph of $f(x) = \left| x - \frac{1}{2} \right|$ and check your graph against the interactive file.



- c. On the same diagram draw $g(x) = 2$.
- d. Where do $f(x)$ and $g(x)$ intersect?
-

- e. Use your graph to determine the values of x for which $\left| x - \frac{1}{2} \right| < 2$.
-

- f. Use your graph, to determine the values of x for which $\left|x - \frac{1}{2}\right| > 2$.

- g. At the points of intersection of $f(x) = g(x)$ is $\left|x - \frac{1}{2}\right| > 2$, $\left|x - \frac{1}{2}\right| < 2$ or $\left|x - \frac{1}{2}\right| = 2$?

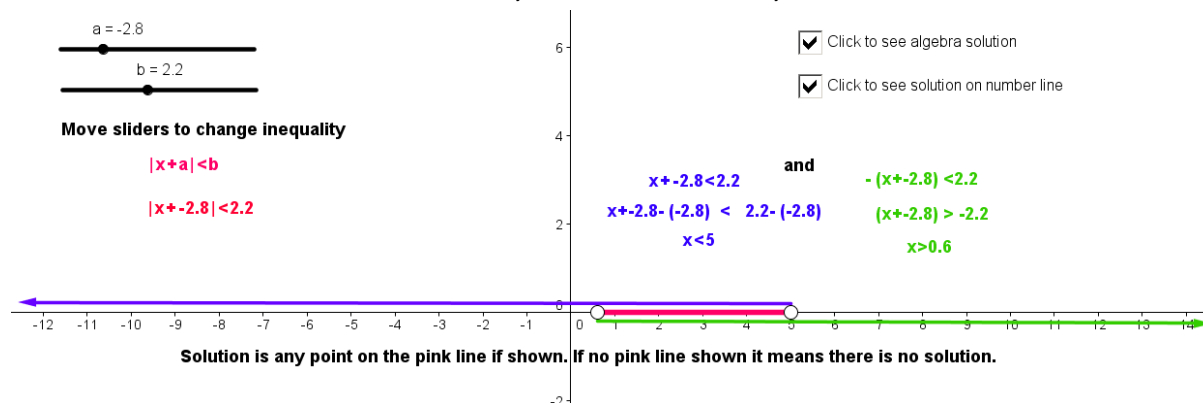
- h. Given $\left|x - \frac{1}{2}\right| < 2$ is it true that $x - \frac{1}{2} < 5$ and $-(x - \frac{1}{2}) < 5$?

- i. Solve the 2 inequalities in the above section of the question using algebra.

- j. Did the solution you got by algebra agree with the solution you got from the graph? If not, recheck your work.

Student Activity: To investigate $|x-a| < b$

Use in connection with the interactive file, 'Absolute Less than', on the student's CD.

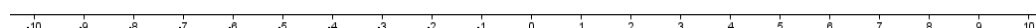


1)

- a) Given $|x-2| < 4$, $x \in \mathbb{R}$, write this as 2 possible inequalities.

- b) Solve these inequalities.

- c) Show the solution which satisfies $|x-2| < 4$ on the number line. Use different coloured pens and explain what each colour means.



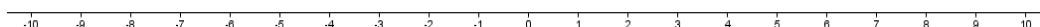
- d) Check your results using the interactive file.

2)

- a) Given $|x+2| < 5$, $x \in \mathbb{R}$, write this as 2 possible inequalities.

- b) Solve these inequalities.

- c) Show the solution which satisfies $|x+2| < 5$ on the number line. Use different coloured pens and explain what each colour means.



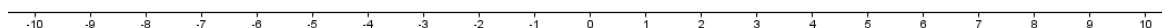
- d) Check your results using the interactive file.

3)

- a) Given $|x-1.8| < 0$, $x \in \mathbb{R}$, write this as 2 possible inequalities.

- b) Solve these inequalities.

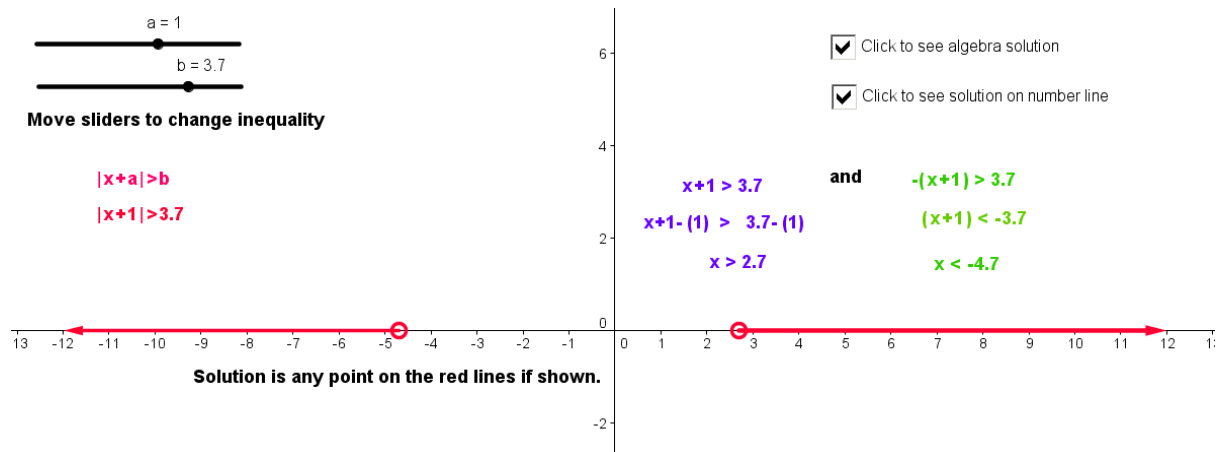
- c) Show the solution which satisfies $|x-1.8| < 0$ on the number line. Use different coloured pens and explain what each colour means.



- d) Check your results using the interactive file.

Student Activity: To investigate $|x-a|>b$

Use in connection with the interactive file, 'Absolute Greater than', on the student's CD.

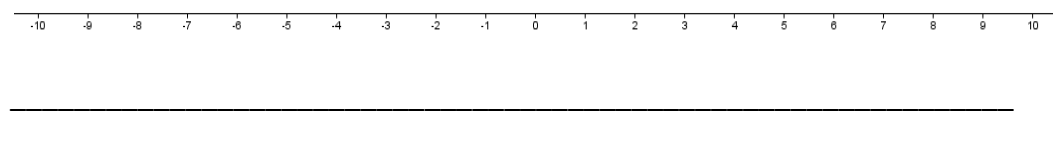


1. Given $|x-2|>5$, $x \in \mathbb{R}$, write this as 2 possible inequalities.

a. _____

- b. Solve these inequalities.

- c. Show the solution which satisfies $|x-2|>5$ on the number line. Use different coloured pens and explain what each colour means.



- d. Check your results using the interactive file.

2.

- a. Given $|x+3|>4$, $x \in \mathbb{R}$, write this as 2 possible inequalities.

b. Solve these inequalities.

c. Show the solution which satisfies $|x+3|>4$ on the above number line. Use different coloured pens and explain what each colour means.



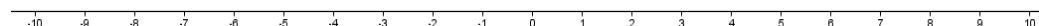
d. Check your results using the interactive file.

3.

a. Given $|x - 1.5| > 0$, $x \in \mathbb{R}$, write this as 2 possible inequalities.

b. Solve these inequalities.

c. Show the solution which satisfies $|x - 1.5| > 0$ on the above number line. Use different coloured pens and explain what each colour means.

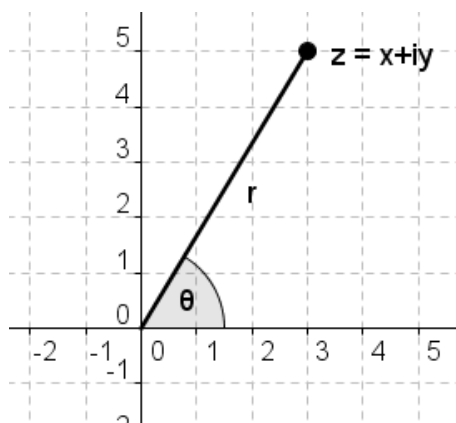


d. Check your results using the interactive file.

Student Activity: To examine complex numbers in polar form

Use in connection with the interactive file, 'Complex Numbers Polar Form', on the Student's CD.

1.



- a. Using the above diagram write x in terms of the modulus r and the argument θ of the complex number z .

- b. Using the above diagram write y in terms r and θ .

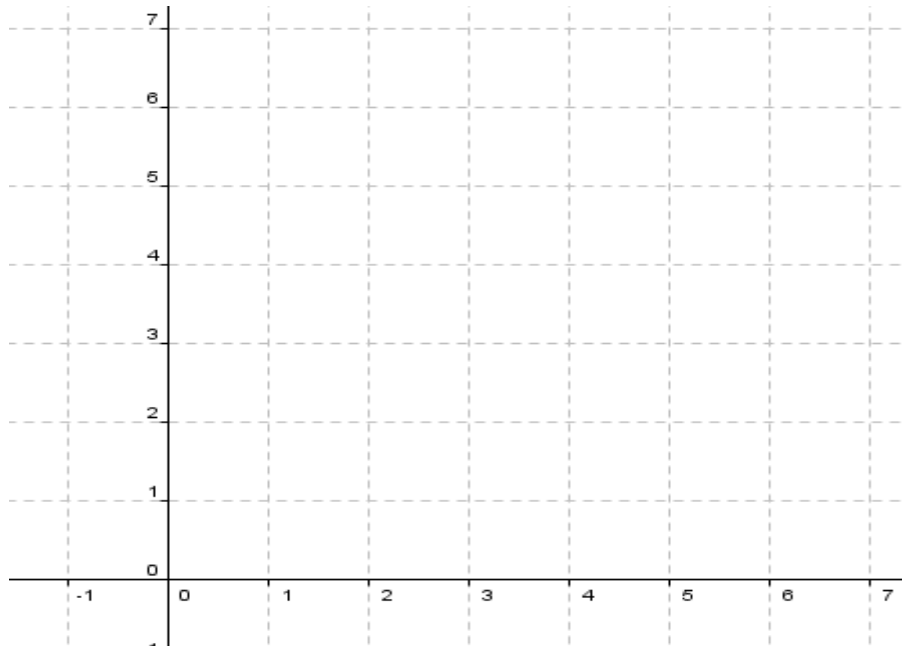
- c. Use your answers to a. and b. to write the complex number in terms of r and θ . This is known as its polar form.

- d. What is $\tan \theta$ in terms of x and y .

- e. Given x and y how can you find θ ?

2.

a. Draw $3+4i$ on the Argand diagram.



b. Measure and calculate R the modulus of $3+4i$.

c. Measure and calculate the angle θ which $3+4i$ makes with the positive Real Axis.

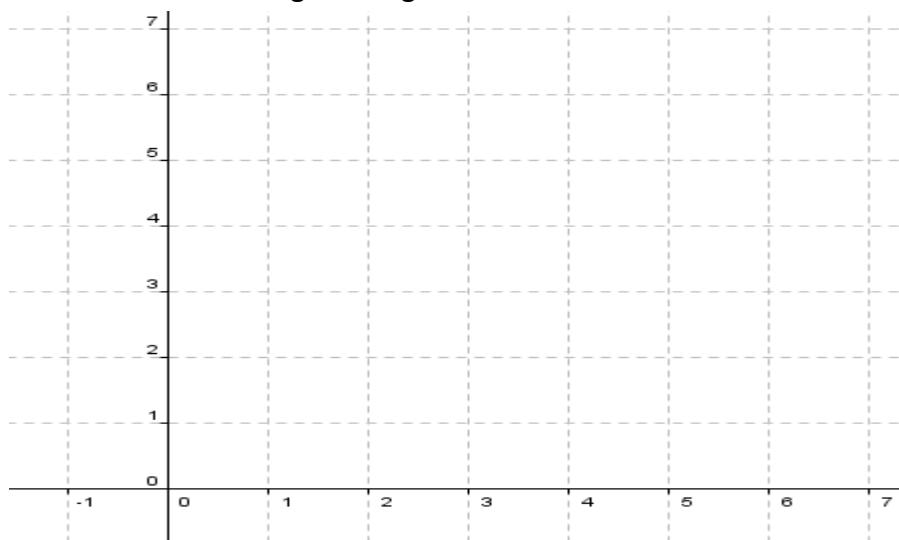
d. Express the angle $3+4i$ makes with the Real Axis in radians.

(Note: 1 radian = $180/\pi$ degrees)

e. Write $3+4i$ in the form $r(\cos \theta + i \sin \theta)$.

3.

- a. Draw $-2 + 5i$ on the Argand diagram.



- b. Calculate the modulus r of $-2 + 5i$?

- c. Measure and calculate the angle θ which $-2 + 5i$ makes with the positive Real axis.

- d. Express θ in radians.
(Note: 1 radian = $180/\pi$ degrees)

- e. Write $-2 + 5i$ in the form $r(\cos\theta + i \sin\theta)$.

4. If you know the polar form of a complex number, what two pieces of information do you know about this complex number?

5. Express $3 + 2i$ in polar form.

6. Express $-3+4i$ in polar form.

7. Express $-2-5i$ in polar form.

8. Express $2-3i$ in polar form.

9. Write $6.4 (\cos 0.67 + i \sin 0.67)$ in the rectangular form. Give your answer correct to 1 decimal place.

10. Write $\frac{1}{\sqrt{2}} + i\frac{\sqrt{2}}{2}$ in polar form

De Moivre's Theorem Quiz

1. What does $\left(\cos \frac{\pi}{2} + i \sin \frac{\pi}{2}\right)^8$ equal?
 - A. $\cos 4\pi + i \sin 4\pi$
 - B. $\cos 8\pi + i \sin 8\pi$
2. What does $\left(\cos \frac{\pi}{3} + i \sin \frac{\pi}{3}\right)^9$ equal?
 - A. $\cos 9\pi + i \sin 9\pi$
 - B. $\cos 3\pi + i \sin 3\pi$
3. Write $(1-i)$ in the form $r(\cos n\theta + i \sin n\theta)$.
 - A. $\sqrt{2}\left(\cos \frac{\pi}{4} + i \sin \frac{\pi}{4}\right)$
 - B. $\sqrt{2}\left(\cos \frac{\pi}{4} - i \sin \frac{\pi}{4}\right)$
4. Write $\cos 8\theta + i \sin 8\theta$ in the form $(\cos \theta + i \sin \theta)^n$.
 - A. $(\cos \theta + i \sin \theta)^4$
 - B. $(\cos \theta + i \sin \theta)^8$
5. Given $Z = \cos \theta + i \sin \theta$. Find $\frac{1}{Z}$.
 - A. $\cos \theta - i \sin \theta$
 - B. $\cos \theta + i \sin \theta$
6. Given $(1-i)$ equals $\sqrt{2}\left(\cos \frac{\pi}{4} - i \sin \frac{\pi}{4}\right)$ write $(1-i)^8$ in the form $a+ib$.
 - A. $16+i0$
 - B. $16(1-i)$
7. Simplify $(\sqrt{3}+i)^3$.
 - A. $8(1-i)$
 - B. $8i$
 - C. $8+8i$

8. Find the 3 cube roots of unity.

A. $1, -\frac{1}{2} + \frac{\sqrt{3}}{2}i, -\frac{1}{2} - \frac{\sqrt{3}}{2}i$

B. $1, \frac{1}{2} + \frac{\sqrt{3}}{2}i, \frac{1}{2} - \frac{\sqrt{3}}{2}i$

C. 1

9. Write $\left[27\left(\cos \frac{\pi}{2} + i \sin \frac{\pi}{2}\right)\right]^{\frac{1}{3}}$ in the form $a + ib$ where $a, b \in \mathbb{R}$.

A. $\frac{3\sqrt{3}}{2} + i\frac{3}{2}$

B. $\frac{3\sqrt{3}}{2} - i\frac{3}{2}$

Given $\cos 3\theta + i \sin 3\theta = \cos^3 \theta - 3 \sin^2 \theta \cos \theta + i(3 \sin \theta \cos^2 \theta + \sin^3 \theta)$.

10. Find $\cos 3\theta$.

A. $\cos^3 \theta - 3 \sin^2 \theta \cos \theta$

B. $3 \sin \theta \cos^2 \theta + \sin^3 \theta$

C. $3 \sin \theta \cos^2 \theta$

Given $\cos 3\theta + i \sin 3\theta = \cos^3 \theta - 3 \sin^2 \theta \cos \theta + i(3 \sin \theta \cos^2 \theta + \sin^3 \theta)$.

11. Find $\sin 3\theta$.

A. $3 \sin \theta \cos^2 \theta$

B. $3 \sin \theta \cos^2 \theta + \sin^3 \theta$

12. Write $\left[27\left(\cos \frac{\pi}{2} + i \sin \frac{\pi}{2}\right)\right]^{\frac{1}{3}}$ in the form $a + ib$ where $a, b \in \mathbb{R}$.

A. $\frac{3\sqrt{3}}{2} + i\frac{3}{2}$

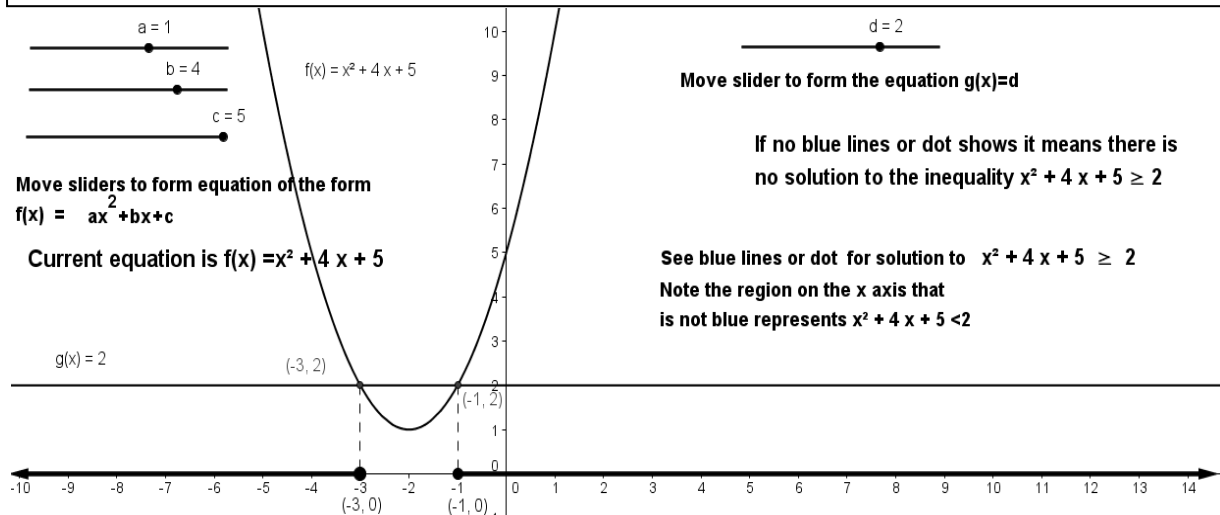
B. $\frac{3\sqrt{3}}{2} - i\frac{3}{2}$

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 $f(x) \leq k$, $f(x) \geq k$, $f(x) < k$ and $f(x) > k$,

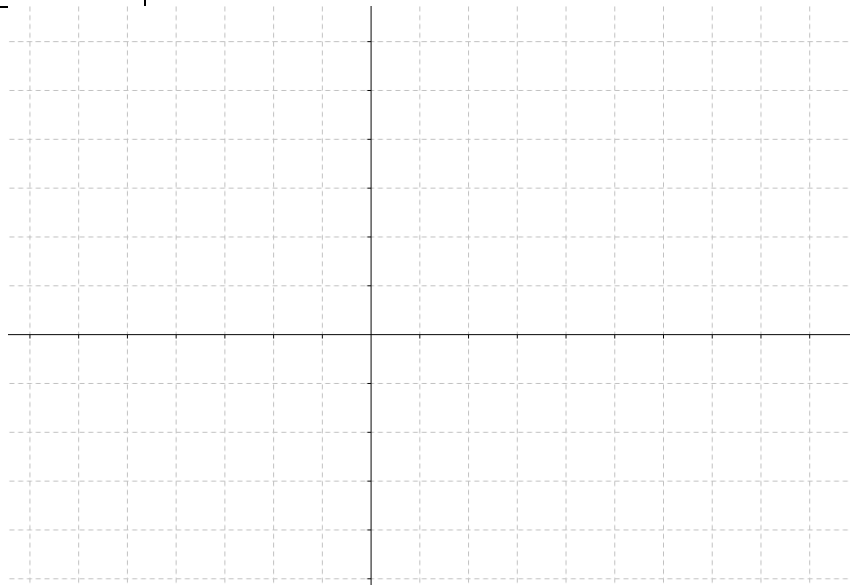
where $f(x) = ax^2 + bx + c$.



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	

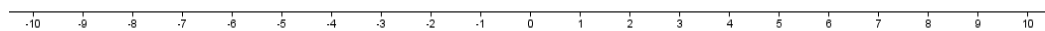


- b) Indicate on the graph and list the points where this graph cuts the x axis. What is the value of $f(x)$ at each of these points?
-

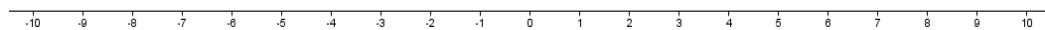
- c) On the same grid, draw the line $g(x) = 2$.
- d) Indicate on the graph and list the points where is $f(x) = g(x)$. Are these the same points as $x^2 + 3x + 2 = 2$? Explain your answer.
-

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

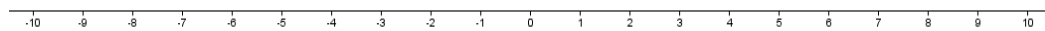
i) $x^2 + 3x + 2 \geq 2$



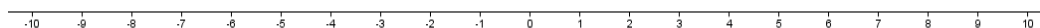
ii) $x^2 + 3x + 2 < 2$



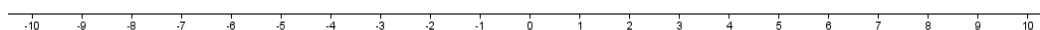
iii) $x^2 + 3x + 2 \leq 2$



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 $f(x) \leq 0$ and $f(x) < 0$ differ with regard to possible solutions?
-

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	



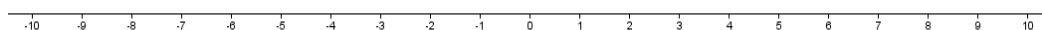
a) Indicate on the graph and list the points where this graph cuts the x axis. What is the value of $f(x)$ at each of these points?

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

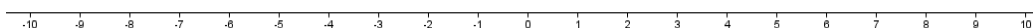
c) Indicate on the graph and list the points where is $f(x) = g(x)$. Are these the same points as $x^2 + 3x + 2 = 2$? Explain your answer.

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

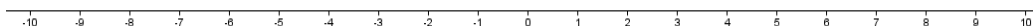
i) $-x^2 + 3x + 2 \leq 1$



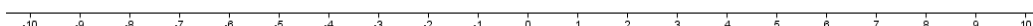
ii) $-x^2 + 3x + 2 \geq 1$



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



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



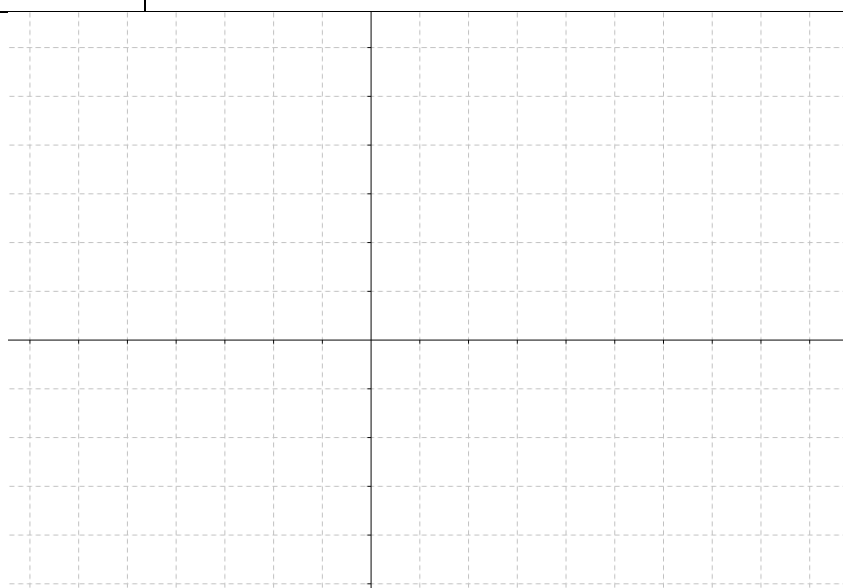
v) $-x^2 + 3x + 2 = 0$



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	

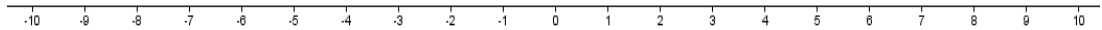


- a) Indicate on the graph and list the points where this graph cuts the x axis. What is the value of $f(x)$ at each of these points?

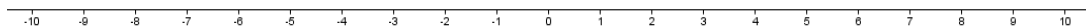
- b) On the same grid, draw the line $g(x) = 4$.
- c) Indicate on the graph and list the points where is $f(x) = g(x)$. Are these the same points as $x^2 + 3x + 2 = 2$? Explain your answer.

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

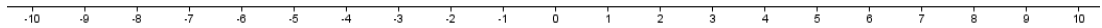
i) $x + 3 - x^2 \geq 4$



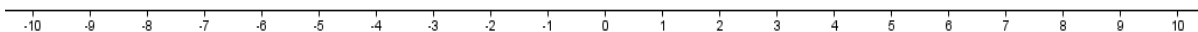
ii) $x + 3 - x^2 < 4$



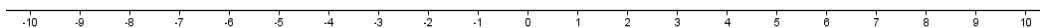
iii) $x + 3 - x^2 \leq 4$



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

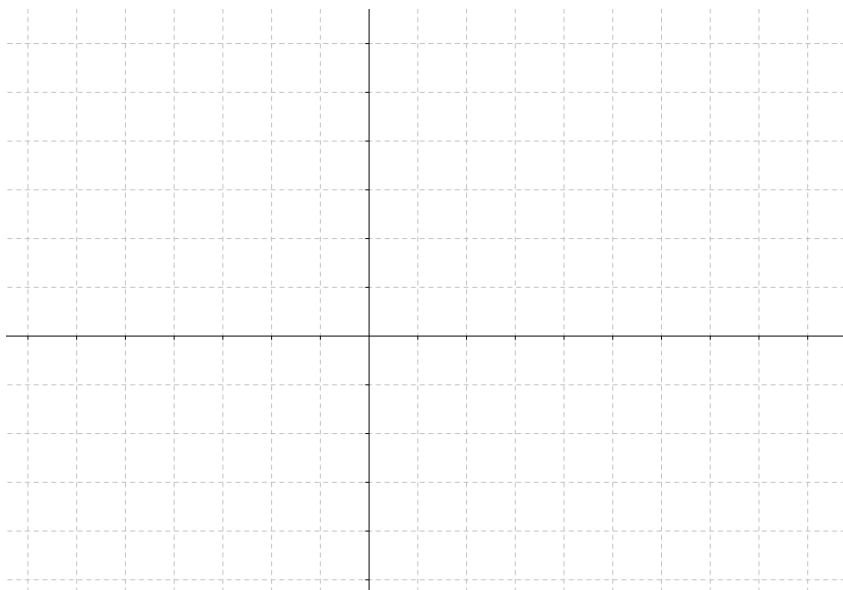


v) $x + 3 - x^2 = 0$



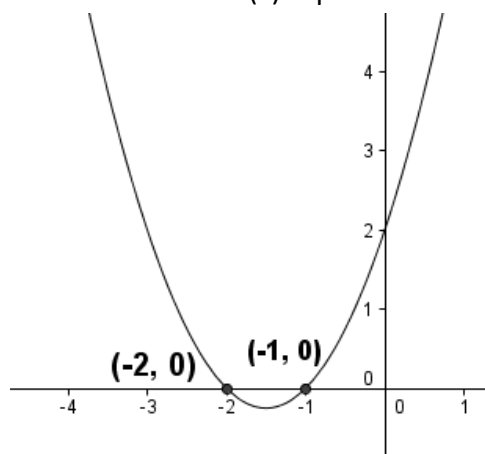
- e) Check your answers using the interactive file.

- 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.



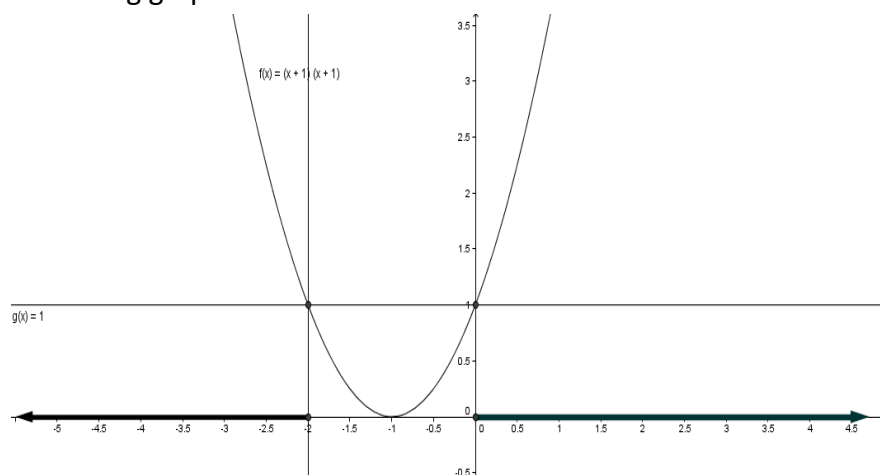
5)

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

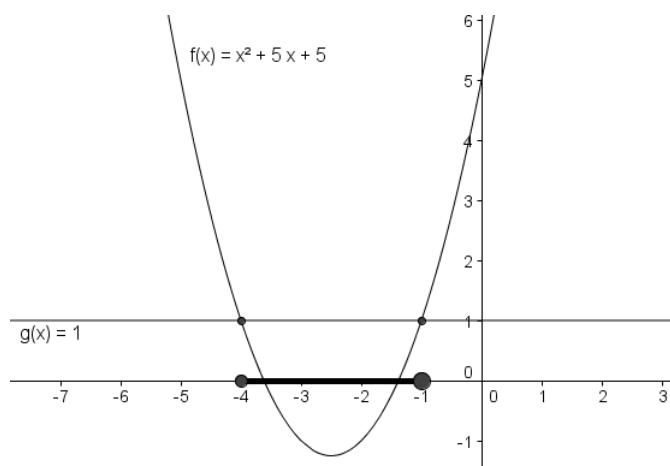


- b) In red, indicate on the graph the solution to the inequality $f(x) \leq 2$.
- c) In blue, indicate on the graph the solution to the inequality $f(x) \geq 2$.
- d) How does the solution to the inequality $f(x) < 2$ differ from that in question b) above with regard to possible solutions?

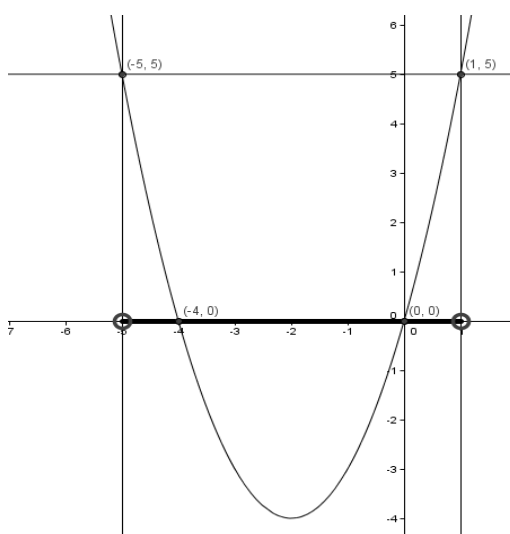
- 6) In words and mathematically, state what inequality is represented by the thick black lines in the following graph.



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

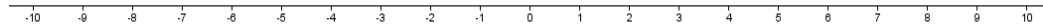


- 8) In words and mathematically, state what inequality is represented by the thick dark black line in the following graph.

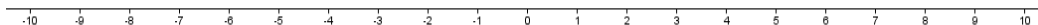


9) Given that $f(x) = x^2 + 2x - 8$, indicate the regions on the number lines which satisfy these inequalities.

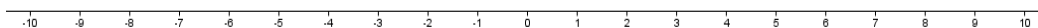
a) $f(x) \geq 0$



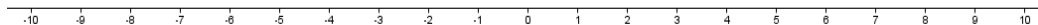
b) $f(x) \leq 0$



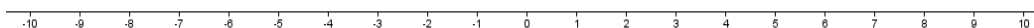
c) $f(x) < 0$



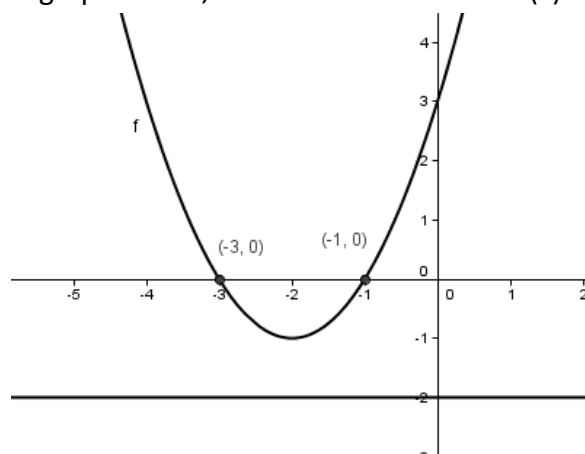
d) $f(x) > 0$



e) $f(x) = 0$

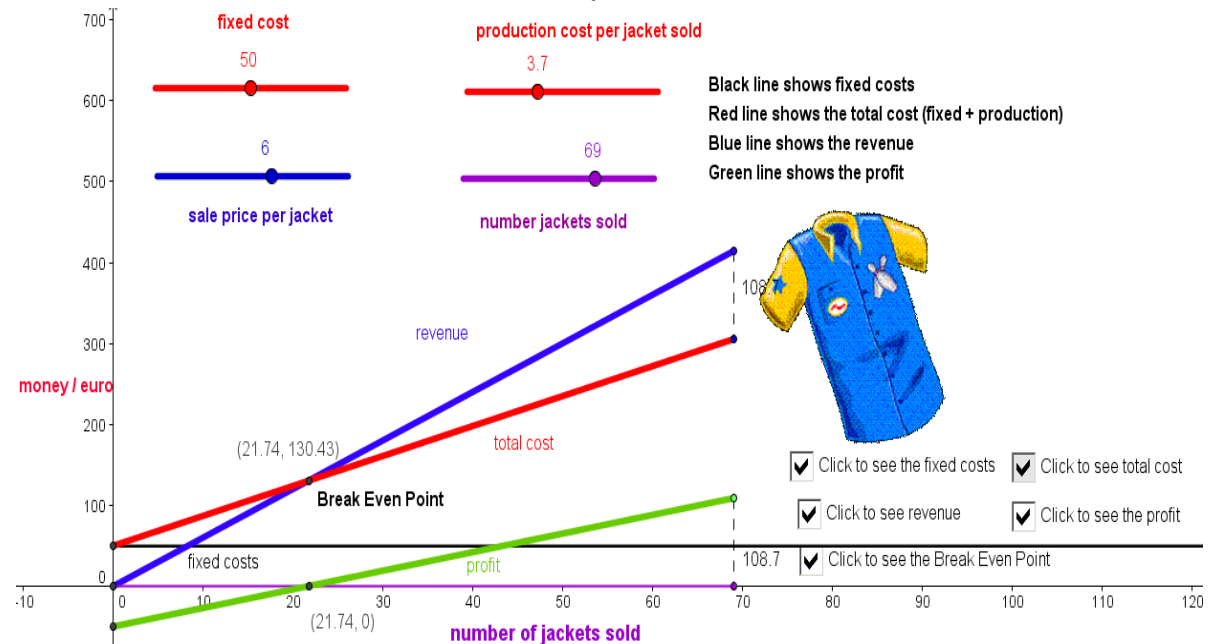


10) Given that $f(x)$ is the quadratic function represented on the graph below and $g(x)$ is the line represented on the graph below, find the solution set to $f(x) \leq g(x)$.



Student Activity: Inequalities in context

Use in connection with the interactive file, 'Inequalities in Context', on the student's CD.



Note: Revenue equals the money received from the sale of the jackets.

1. The diagram above illustrates the financial situation of a sports shop, what two types of costs do the shop incur regarding the jackets it sells.

2. What effect does the number of jackets sold have on the fixed cost?

3. What effect does the number of jackets sold have on the production cost per jacket sold?

You are given the following information: (Assume this firm sells all jackets it produces.)

- x = the number of jackets sold
- fixed cost = €50
- production cost per jacket = €3.70
- sale price per jacket = €6

- a. Write a formula in terms of x for the total cost of the jackets sold?

- b. Write an equation that describes the revenue in terms of x ?

- c. Which one of these inequalities represents the relationship between the total costs and the revenue when a profit is achieved? Explain your answer.

$$50 + 3.7x < 0$$

$$50 + 3.7x \leq 6x$$

$$6x > 0$$

$$50 + 3.7x \geq 6x$$

$$50 + 3.7x < 6x$$

- d. Solve the inequality that represents the relationship between the total cost and the revenue when the shop is making a profit.

- e. The owner of the shop has to decide the minimum number of jackets to produce in order to make a profit. How does the answer to the previous section of this question help him make this decision?

- f. What is meant by the “**Break Even**” point and what is the relationship between the total cost and the revenue at this point?

- g. Express the profit in terms of x .

- h. Write in terms of x the inequality that represents the situation where the business must make at least €200 profit on these jackets?

- i. Solve the above inequality.

- j. What information does the solution to this inequality give the owner of the business?

4. Complete the following table for a business that is considering manufacturing a new jacket given the following information: (Assume this firm sells all jackets it produces.)

- x = the number of jackets sold
- fixed costs = €100
- production costs per jacket = €5
- sale price per jacket = €10.

number of jackets produced	fixed cost	production cost per jacket manufactured	total cost	revenue	profit
0					
10					
20					
30					
40					

- On the graph paper provided draw the line that represents the fixed cost for these jackets. Be sure to clearly label each axis of the graph.
- On the same diagram draw the line that represents the total cost for these jackets.
- On the same diagram draw the line that represents the revenue for these jackets?
- On the same diagram draw the line that represents the profit for these jackets?



e. At what point in your diagram does the business start to make a profit on these jackets?

f. Write the total cost in terms of x the number of these jackets manufactured.

g. Write the revenue in terms of x the number of these jackets manufactured.

h. Write an inequality in terms of x the number of these jackets manufactured that represents the situation where the business is making a profit.

i. Solve the above inequality.

- j. What information does the solution give you in the context of this business?

- k. What is the minimum amount of jackets that must be produced in order to break even (or above which the business will make a profit)?

- l. Use the diagram to find how much profit the business will make if it manufactures 120 of these jackets?

- m. What is the expression in terms of x , the number of these jackets manufactured, that would represent the profit or loss?

- n. What inequality would represent the situation where the business must make at least €200 profit on the sale of these jackets?

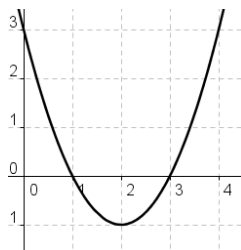
- o. Solve the above inequality.

- p. What information does the solution to this inequality give us in the context of this business?

Student Activity: To investigate polynomials

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

1)



a) How many times does this graph cut the x axis?

b) Where does this graph cut the x axis? What does this tell you about these points?

c) What does this tell you about the y values at these points?

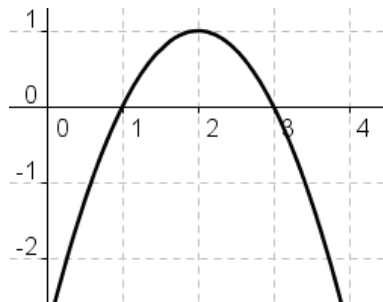
d) Write the equation of this function in the form $f(x) = (x-a)(x-b)$.

e) Are the y values in this function positive or negative when x is greater than 3? Explain.

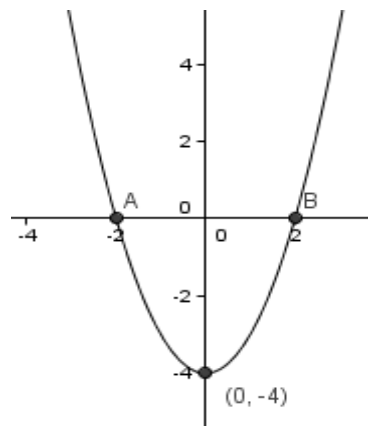
f) Are the y values in this function positive or negative between 1 and 3? Explain your answer.

g) Using the interactive file determine how $g(x) = -f(x)$ differs from $f(x) = (x-a)(x-b)$.

h) What is the equation of the polynomial represented by the graph below?



2)



a) Given the points $A(a,0)$ and $B(b,0)$ as shown in the diagram above, find the equation of the function represented in the diagram.

b) Where are the y values increasing in this diagram?

c) Where are the y values decreasing in this diagram?

3) Given the polynomial is $f(x) = (x-3)(x-4)(x-5)$, answer the following questions.

a) What are the roots of $f(x) = 0$?

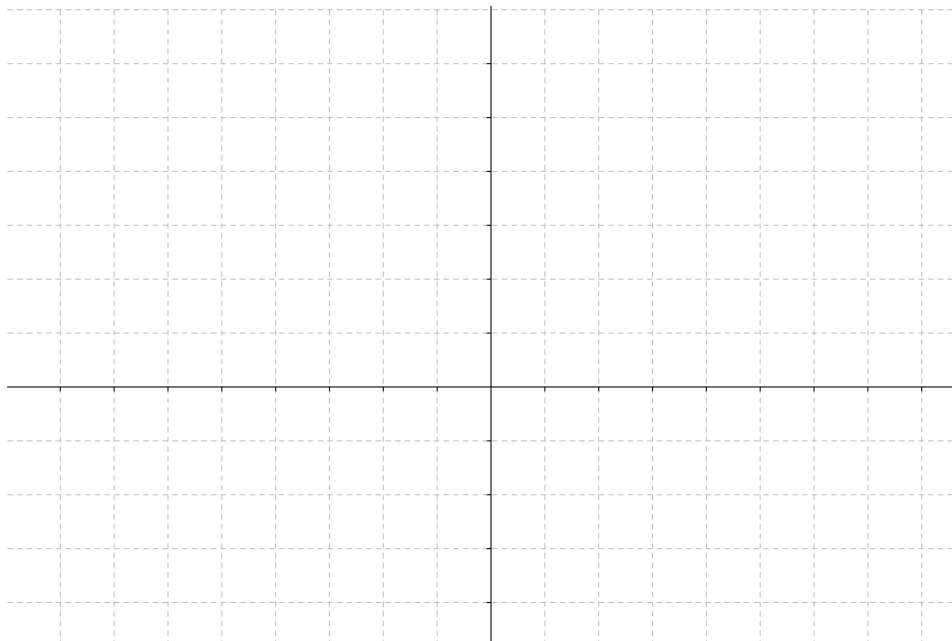
b)

i) For $x = 5$, what is the value of $f(x)$?

ii) For $x = 3$, what is the value of $f(x)$?

iii) For $x = 4$, what is the value of $f(x)$?

iv) Plot these 3 points as part of the graph of $f(x)$.



c) For $x > 5$,

i) What is the sign of $(x-3)$?

ii) What is the sign of $(x-4)$?

iii) What is the sign of $(x-5)$?

iv) Hence what is the sign of $f(x) = (x-3)(x-4)(x-5)$ for $x > 5$?

v) Complete the graph already started above of $f(x) = (x-3)(x-4)(x-5)$, for $x > 5$.

vi) Using the same reasoning as above what is the sign of $f(x)$ for $4 < x < 5$?

d)

i) What is the sign of $f(x)$ for $3 < x < 4$?

ii) What is the sign of $f(x)$ for $x < 3$?

iii) Complete the graph already started above of $f(x) = (x-3)(x-4)(x-5)$, for all values of x .

4) Given the polynomial is $g(x) = (x-2)(x-3)(x-4)$, answer the following questions.

a) What are the roots of $g(x) = 0$?

b) What is the largest root r of $g(x)$?

c) What is the value of $g(r)$ where r is the largest root of $g(x) = 0$?

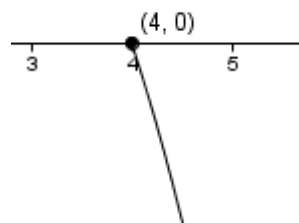
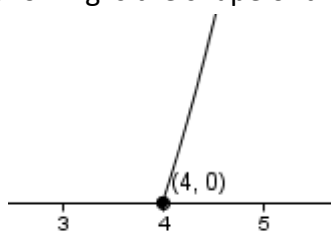
d) What is $r+1$ and what value has $g(r+1)$?

e) Is $g(r+1)$ positive or negative?

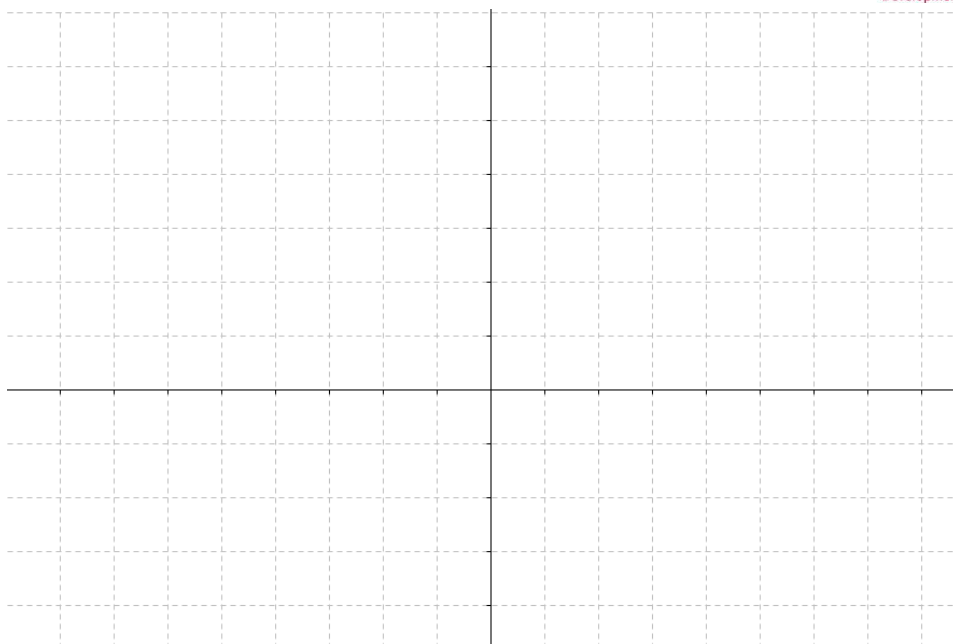
f) What is the sign of $g(x)$ when $x > r$?

g) Hence is the graph of the polynomial $g(x)$ when $x > r$ increasing or decreasing?

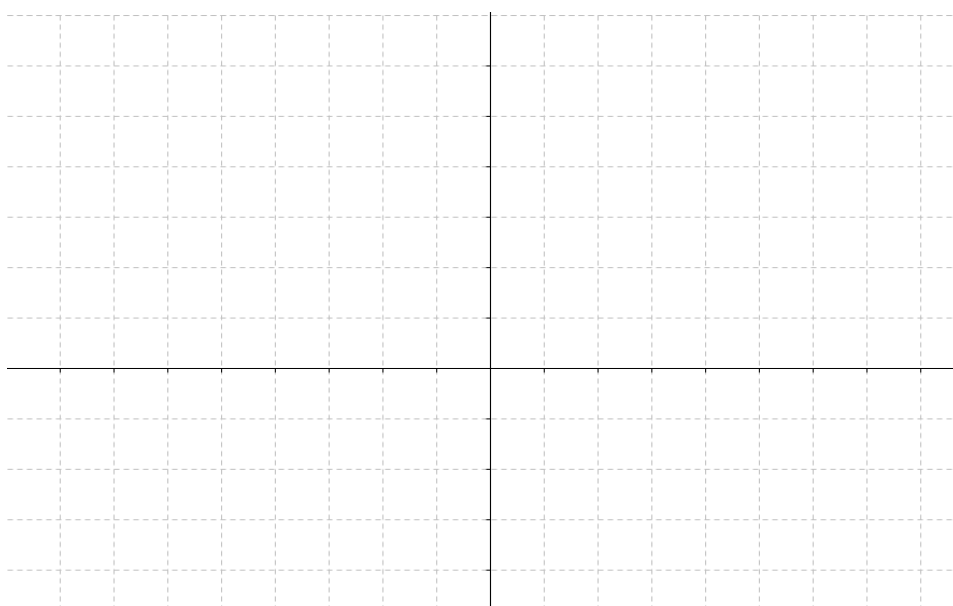
h) Which of the following is the shape of the polynomial when $x > 4$?



i) Complete a sketch of $y = g(x) = (x-2)(x-3)(x-4)$. Note it is only a sketch and exact heights are not required.



j) Using the interactive file determine the shape of the graph $h(x) = -g(x)$?



5) Given the polynomial is $g(x) = (x-2)(x-1)(x-4)$, answer the following questions.

a) What are the roots of $g(x) = 0$?

b) What is the largest root r of $g(x)$?

c) What is the value of $g(r)$ where r is the largest root of $g(x) = 0$?

d) What is $r+1$ and what value has $g(r+1)$?

e) Is $g(r+1)$ positive or negative?

f) What is the sign of $g(x)$ when $x > r$?

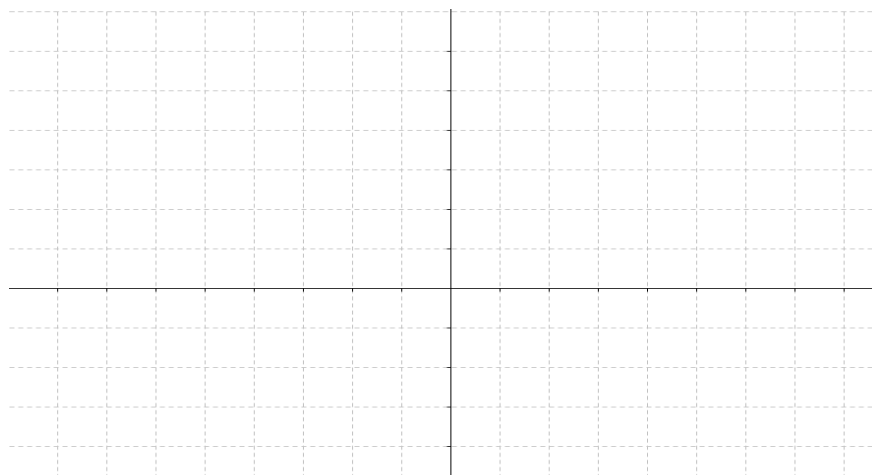
g) Hence is the graph of the polynomial $g(x)$ when $x > r$ increasing or decreasing?

h) What is the shape of the polynomial when $x > 4$?

i) Complete a sketch of $y = g(x) = (x-2)(x-1)(x-4)$. Note it is only a sketch and exact heights are not required.



j) Using the interactive file determine the shape of the graph $h(x) = -g(x)$?



6) Given the polynomial is $g(x) = (x+2)(x+1)(x-2)$, answer the following questions.

a) What are the roots of $g(x) = 0$?

b) What is the largest root r of $g(x)$?

c) What is the value of $g(r)$ where r is the largest root of $g(x) = 0$?

d) What is $r+1$ and what value has $g(r+1)$?

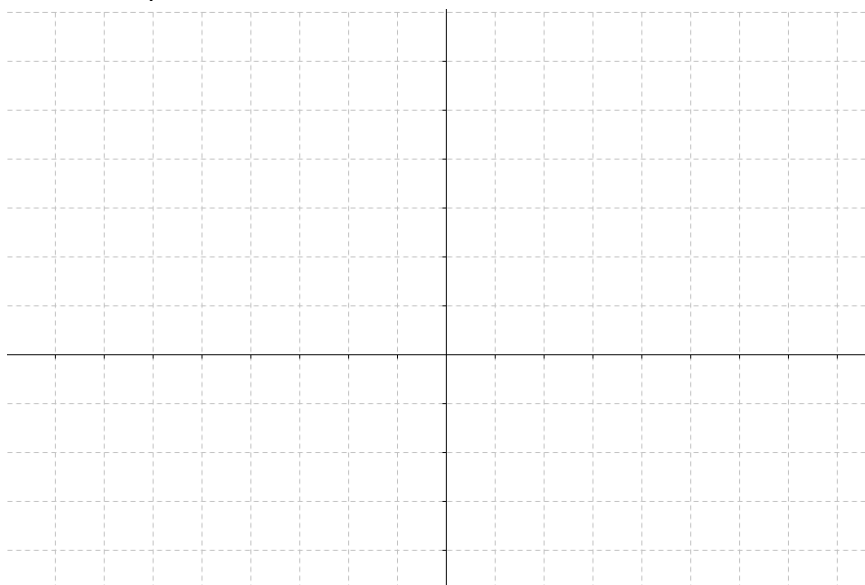
e) Is $g(r+1)$ positive or negative?

f) What is the sign of $g(x)$ when $x > r$?

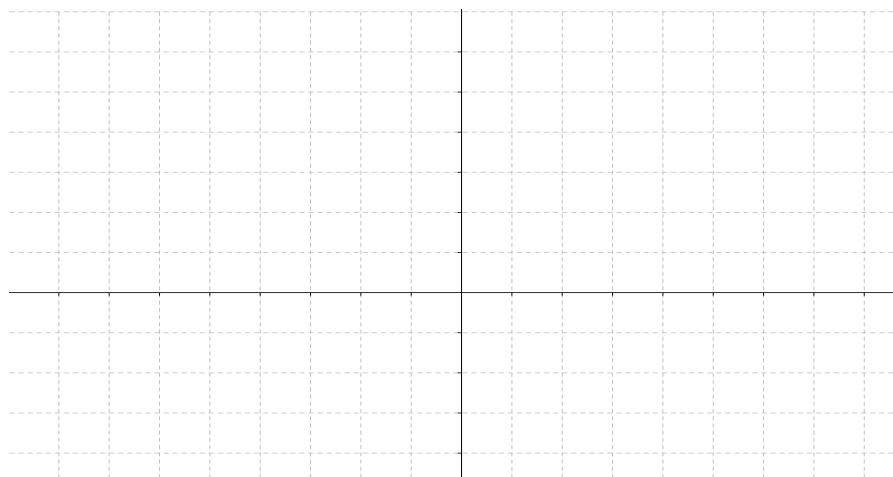
g) Hence is the graph of the polynomial $g(x)$ when $x > r$ increasing or decreasing?

h) What is the shape of the polynomial when $x > 2$?

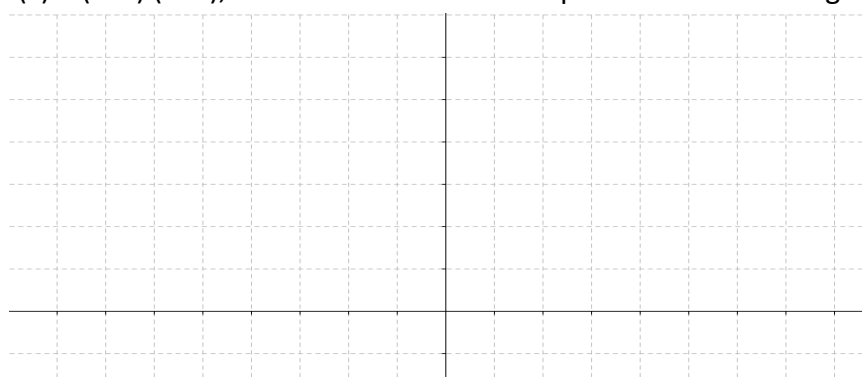
i) Complete a sketch of $y = g(x) = (x+2)(x+1)(x-2)$. Note it is only a sketch and exact heights are not required.



- j) Using the interactive file determine the shape of the graph $h(x) = -g(x)$?



- 7) Using the interactive file determine the shape of the graph that represent $s(x) = (x-a)(x-b)$, when both a and b are equal to 2. Sketch the graph.

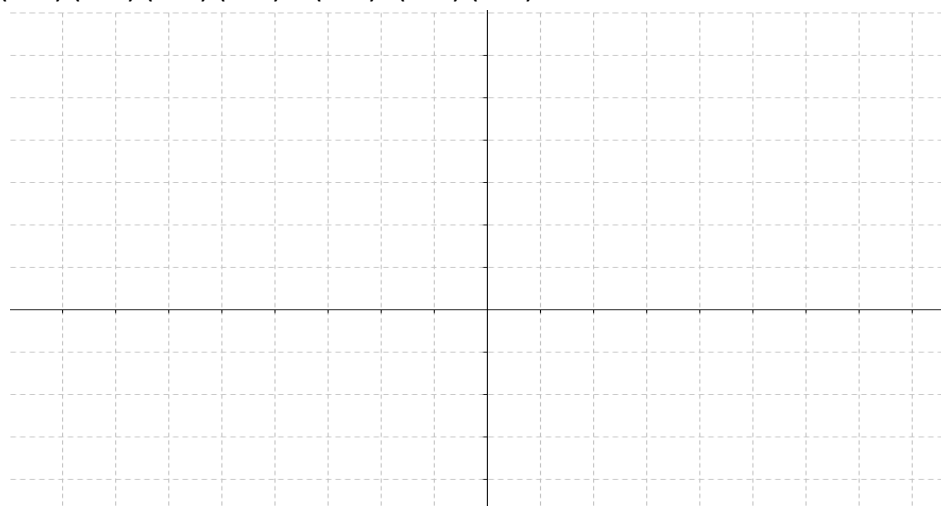


- a. When $x > 2$ what is the sign of $y = s(x)$?

- b. When $x < 2$ what is the sign of $y = s(x)$?

- 8) With the help of the interactive file sketch the graph of the function

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



- a. Is this graph positive or negative for $x > 4$?

- b. What happens to this graph at $x = 4$?

- c. What happens to this graph between 3 and 4?

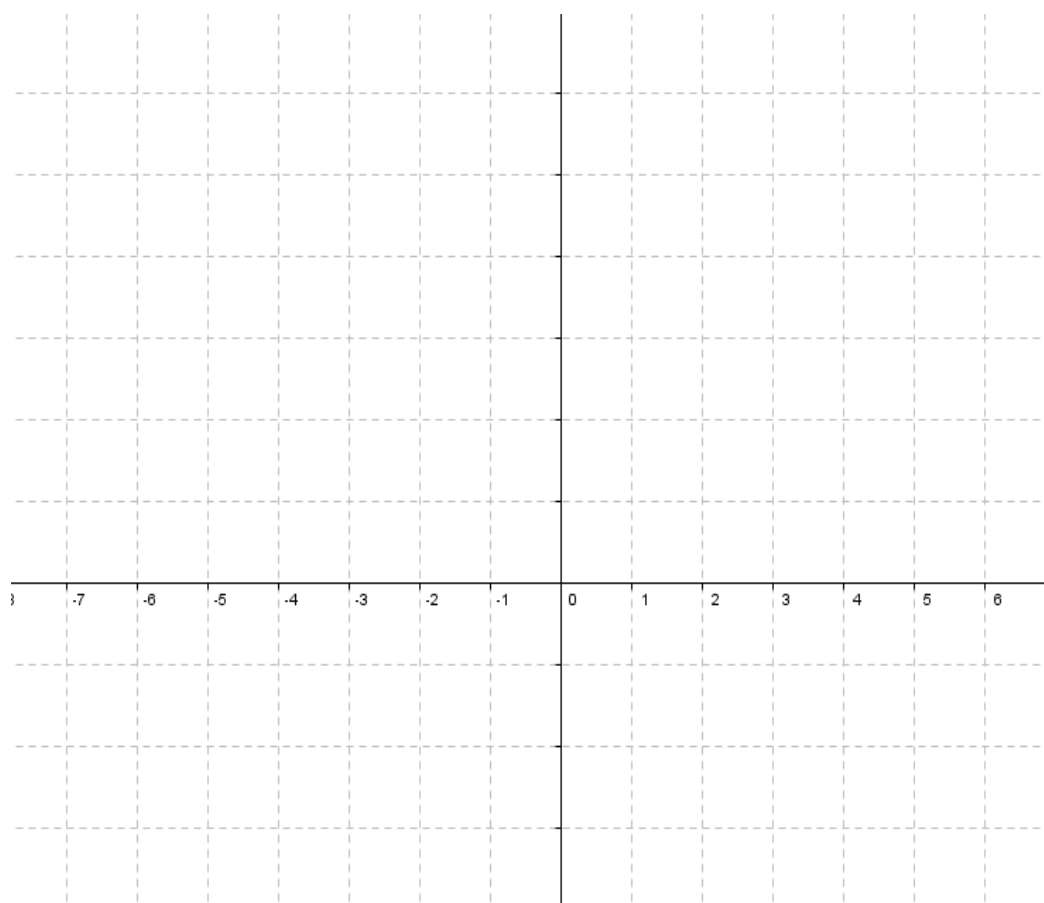
- d. What happens to this graph at 3?

- e. What happens to this graph between 2 and 3?

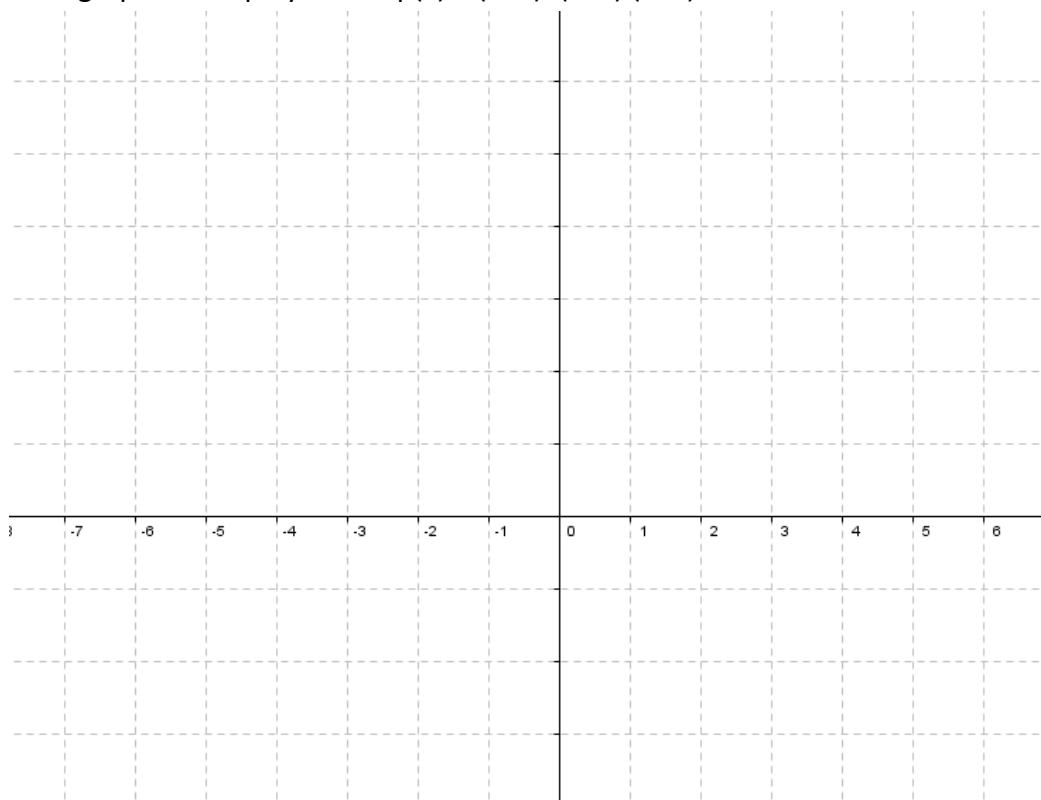
- f. What happens to this graph at 2?

- g. What happens to this graph between 1 and 2?

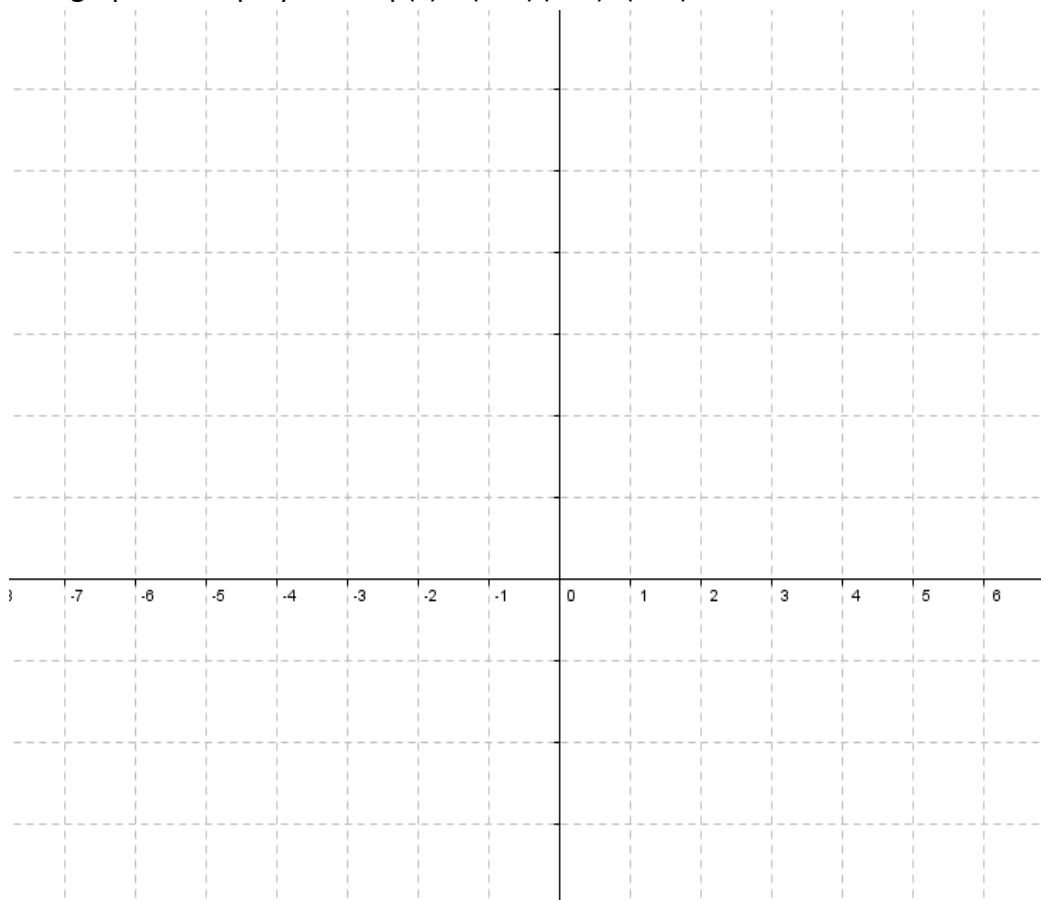
- h. Using the interactive file determine the shape of the graph $h(x) = -g(x)$?



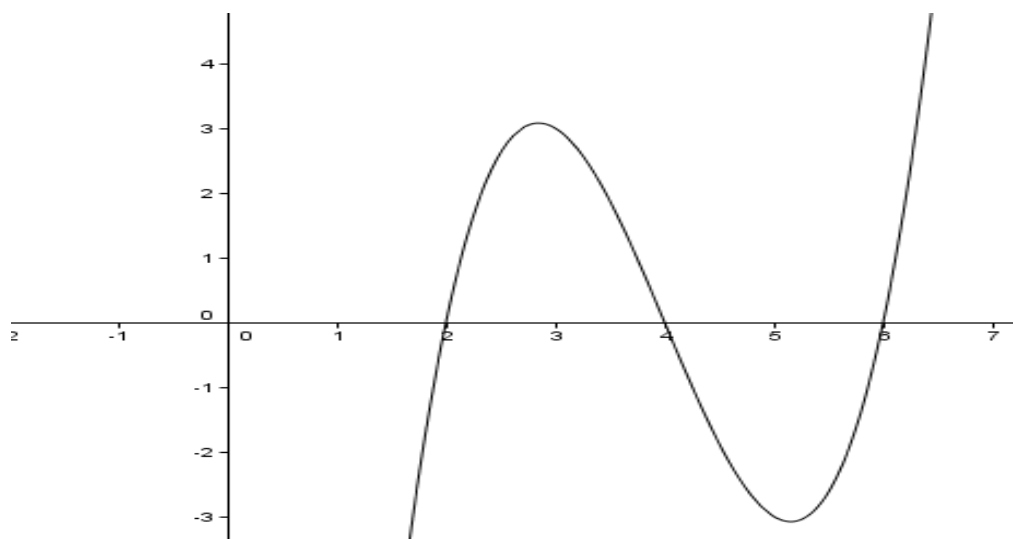
9) Sketch the graph of the polynomial $p(x) = (x-1)^2 (x-2) (x-3)$.



10) Sketch the graph of the polynomial $p(x) = (x-1) (x-2)^2 (x-3)$.



11)



- a. Where does this graph cut the x axis? What does this tell you about these points?

- b. What is the equation of this graph?

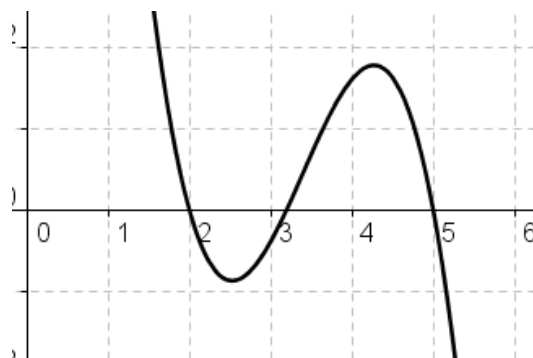
- c. For what values of x is this graph positive and increasing?

- d. For what values of x is this graph positive and decreasing?

- e. For what values of x is this graph negative and increasing?

- f. For what values of x is this graph negative and decreasing?

12)



- a. Where does this graph cut the x axis? What does this tell you about these points?

- b. How many times does this graph cut the x axis?

- c. For what values of x is this graph positive and increasing?

- d. For what values of x is this graph positive and decreasing?

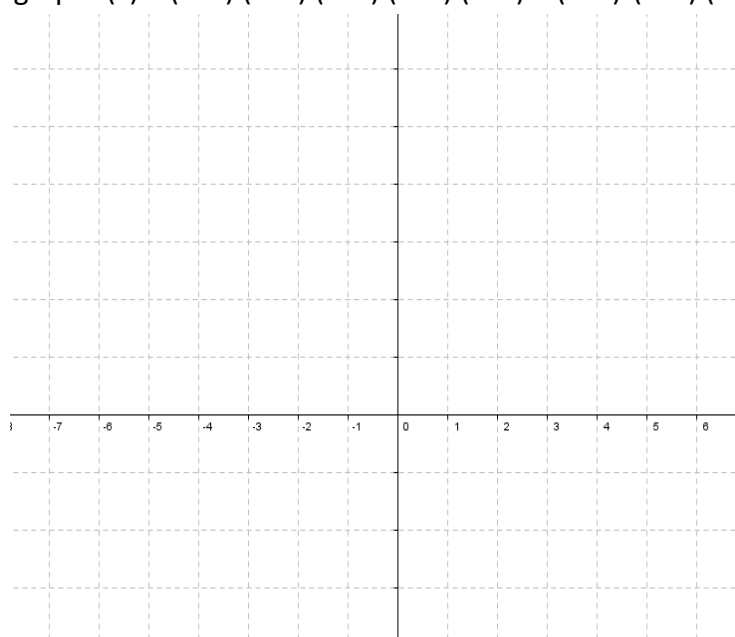
- e. For what values of x is this graph negative and increasing?

- f. For what values of x is this graph negative and decreasing?

- g. What is the equation of this graph? Check your answer using the interactive file.

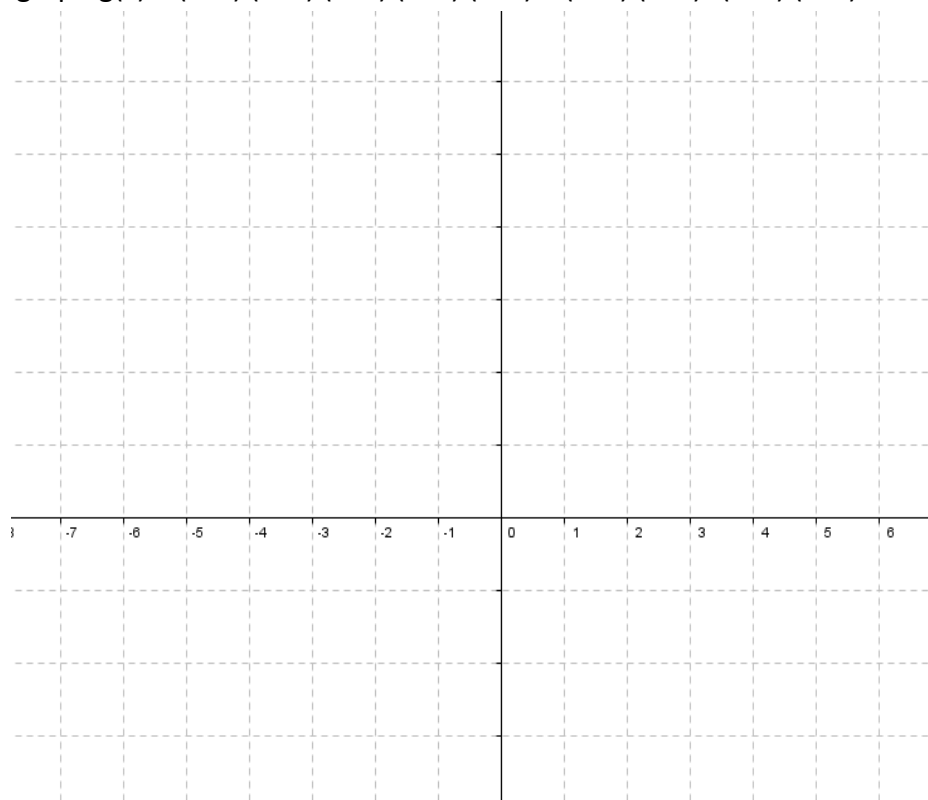
13)

- a. Sketch the graph $f(x) = (x-2)(x-2)(x-2)(x-1)(x-4) = (x-2)^3(x-1)(x-4)$.

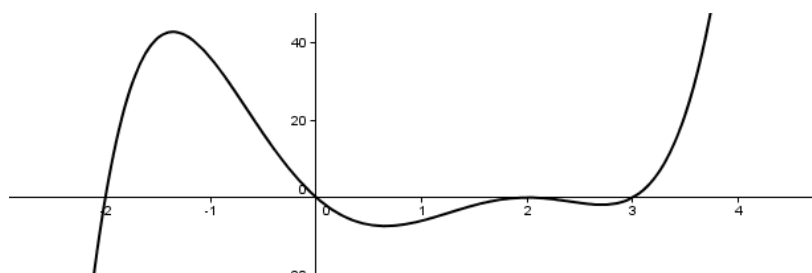


- b. What happens to the graph at $x=2$?

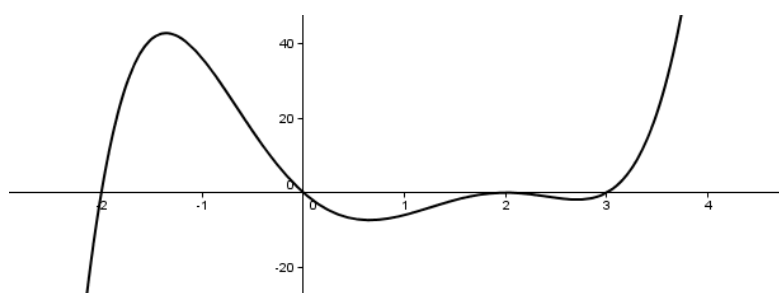
14) Sketch the graph $g(x) = (x+2)(x-2)(x-2)(x+1)(x-4) = (x+2)(x-2)^2(x+1)(x-4)$.



15) What is the equation of the polynomial where the highest power of x is 5, represented by the following graph?

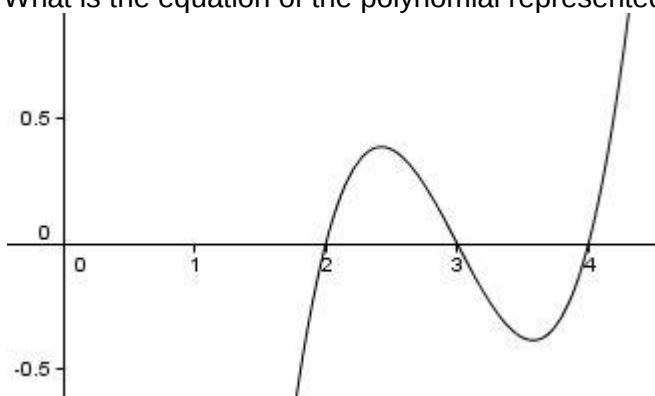


16) What is the equation of the polynomial where the highest power of x is 7, represented by the following graph?

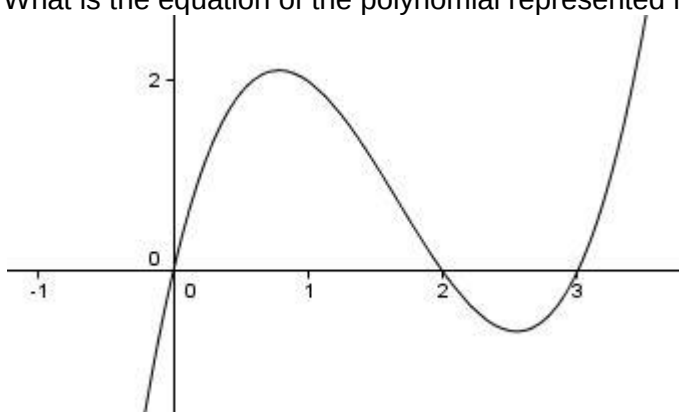


Polynomials Quiz

1. What is the equation of the polynomial represented in this diagram?

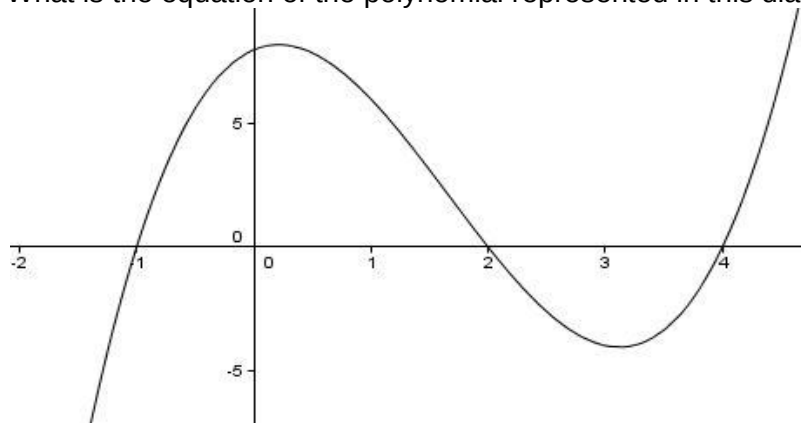


- A. $y = (x - 2)(x - 3)(x - 5)$
 B. $y = (x - 2)(x - 3)(x - 4)$
 C. $y = (x + 2)(x + 3)(x + 4)$
 D. $y = (x + 2)(x + 3)(x + 4)$
2. What is the equation of the polynomial represented in this diagram?



- A. $y = x(x + 2)(x + 3)$
 B. $y = (x + 1)(x + 2)(x + 3)$
 C. $y = x(x - 2)(x - 3)$
 D. $y = (x - 1)(x - 2)(x - 3)$

3. What is the equation of the polynomial represented in this diagram?



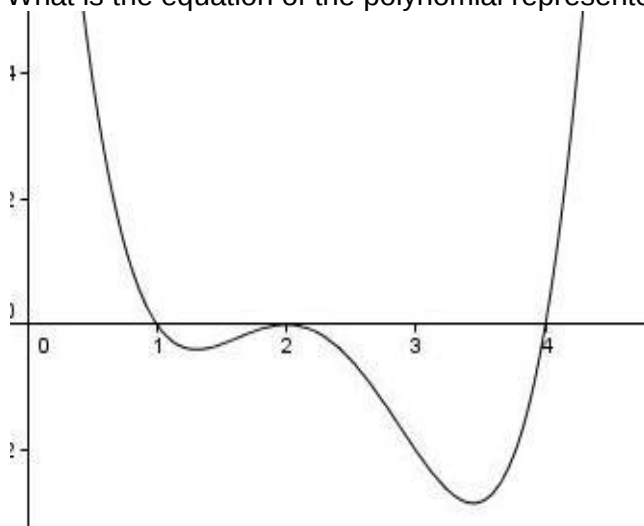
A. $y = (x + 1)(x + 2)(x + 4)$

B. $y = (x - 1)(x + 2)(x + 4)$

C. $y = (x - 1)(x - 2)(x - 4)$

D. $y = (x + 1)(x - 2)(x - 4)$

4. What is the equation of the polynomial represented in this diagram?

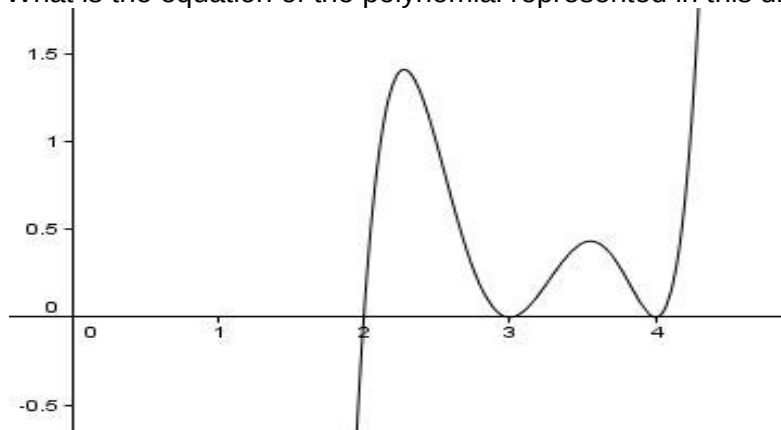


A. $y = (x + 1)(x + 2)(x + 4)$

B. $y = (x - 1)(x - 2)(x - 2)(x - 4)$

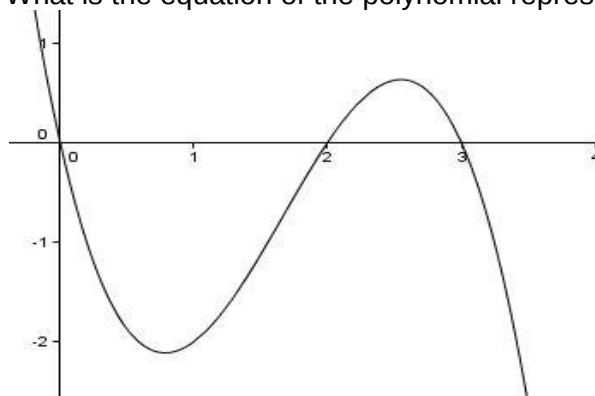
C. $y = (x + 1)(x + 2)(x + 2)(x + 4)$

5. What is the equation of the polynomial represented in this diagram?



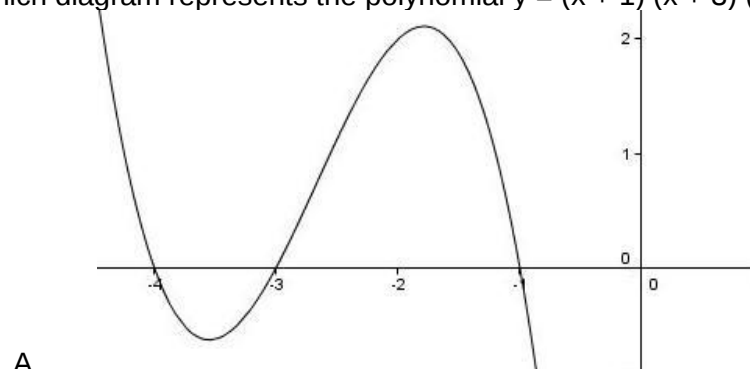
- A. $y = (x + 2)(x + 3)(x + 3)(x + 4)(x + 4)$
- B. $y = (x - 2)(x - 3)(x - 4)$
- C. $y = (x - 2)(x - 3)(x - 4)$
- D. $y = (x - 2)(x - 3)(x - 3)(x - 4)(x - 4)$

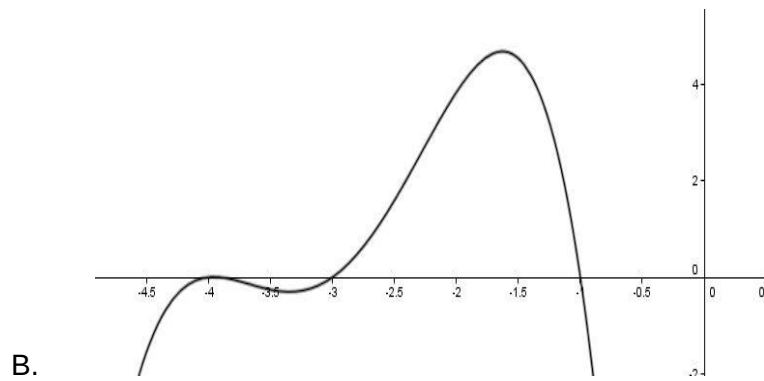
6. What is the equation of the polynomial represented in this diagram?



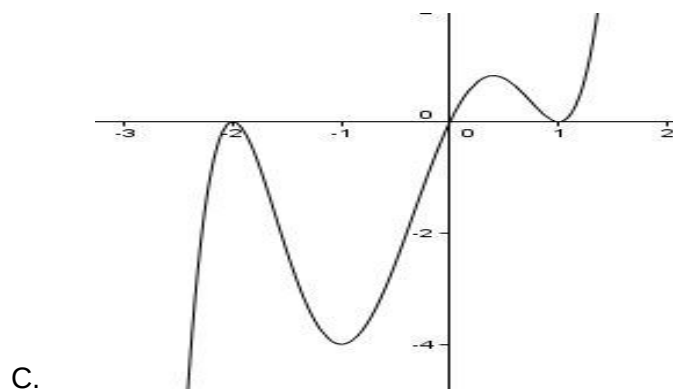
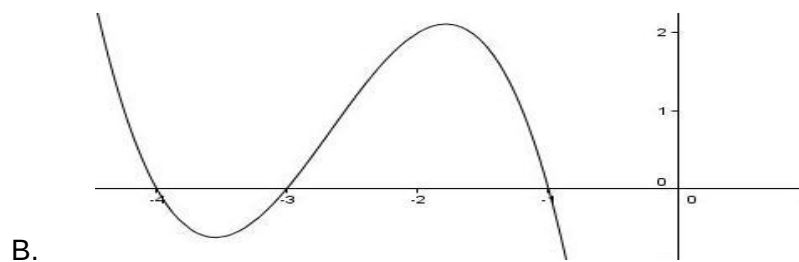
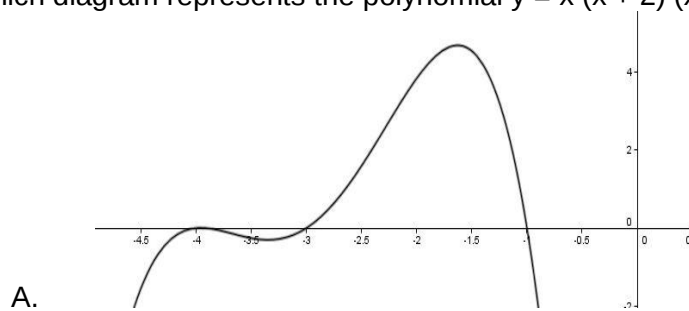
- A. $y = -x(x - 2)(x - 3)$
- B. $y = x(x + 2)(x + 3)$
- C. $y = -x(x + 2)(x + 3)$
- D. $y = x(x - 2)(x - 3)$

7. Which diagram represents the polynomial $y = (x + 1)(x + 3)(x + 4)$?

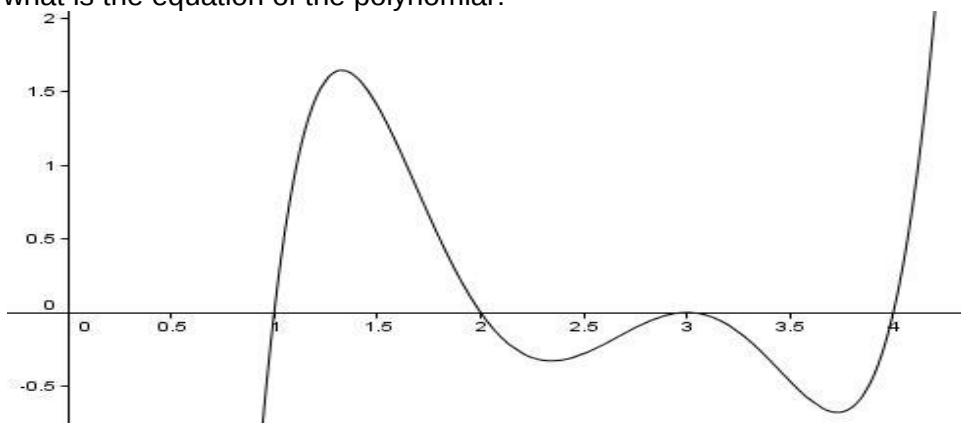




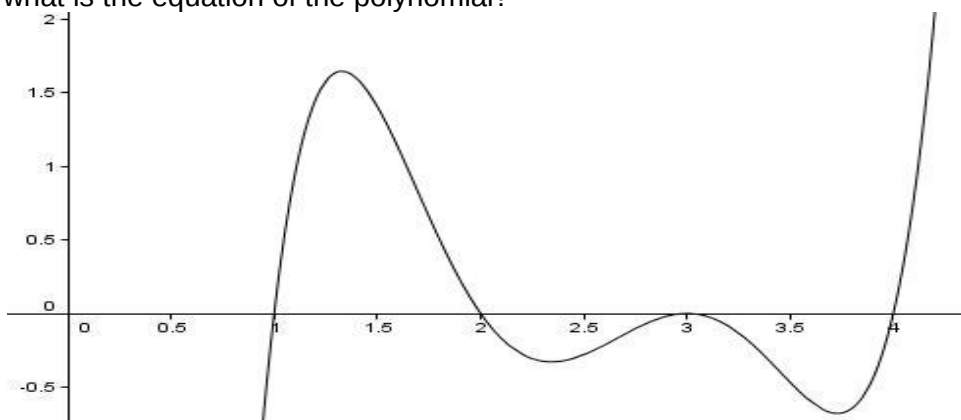
8. Which diagram represents the polynomial $y = x(x+2)(x+2)(x-1)(x-1)$?



9. Given that the highest power of x in the polynomial represented in this diagram is 5, what is the equation of the polynomial?



- A. $y = (x - 1)(x - 2)(x - 3)(x - 4)$
 B. $y = (x - 1)(x - 2)(x - 3)(x - 3)(x - 4)$
 C. $y = (x + 1)(x + 2)(x + 3)(x + 3)(x + 4)$
 D. $y = (x + 1)(x + 2)(x + 3)(x + 4)$
10. Given that the highest power of x in the polynomial represented in this diagram is 7, what is the equation of the polynomial?



- A. $y = (x - 1)(x - 2)(x - 3)(x - 3)(x - 4)$
 B. $y = (x - 1)(x - 2)(x - 3)(x - 3)(x - 3)(x - 3)(x - 4)$
 C. $y = (x + 1)(x + 2)(x + 3)(x + 3)(x + 4)$
 D. $y = (x + 1)(x + 2)(x + 3)(x + 3)(x - 3)(x - 3)(x + 4)$