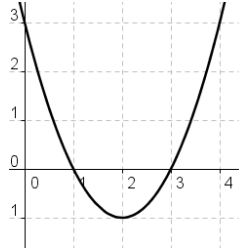


Student Activity: To investigate polynomials

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?

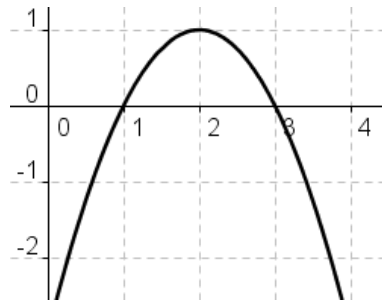
d) Write the equation of this function in the form $f(x) = (x-a)(x-b)$.

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

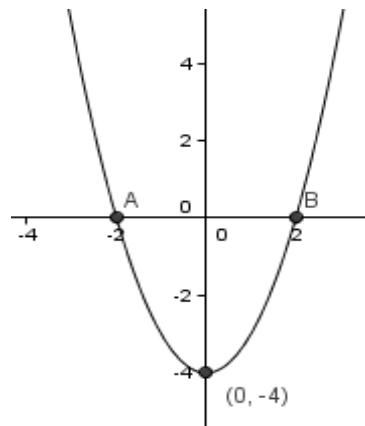
f) Are the y values in this function positive or negative between 1 and 3? Explain your answer.

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 $f(x) = 0$?

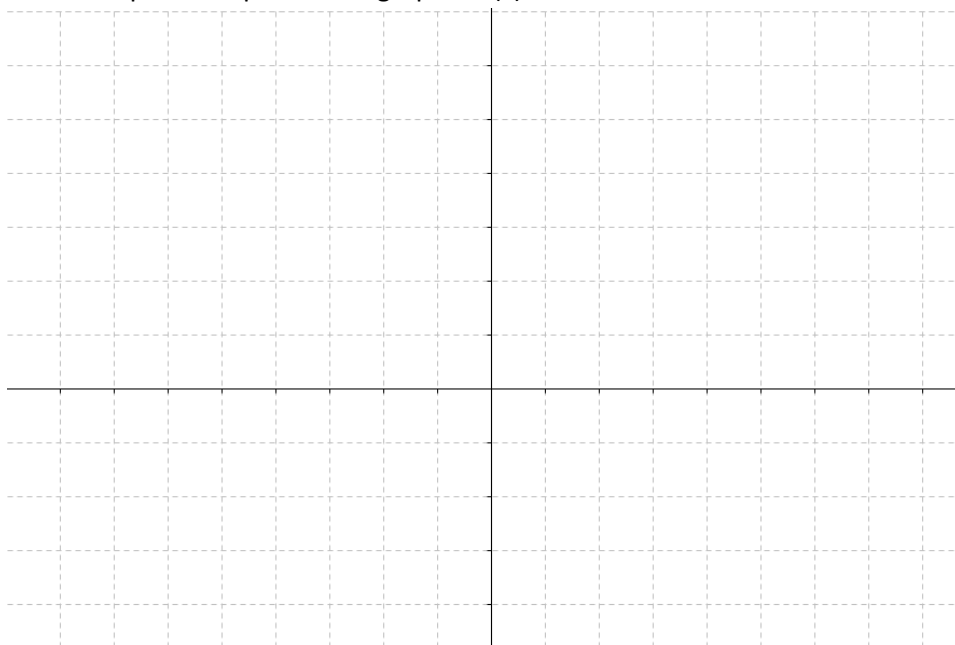
b)

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 $g(x) = 0$?

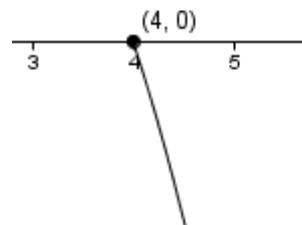
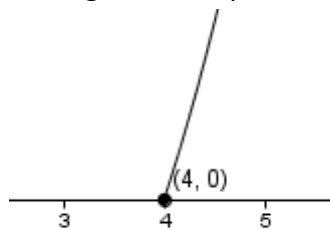
d) What is $r+1$ and what value has $g(r+1)$?

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

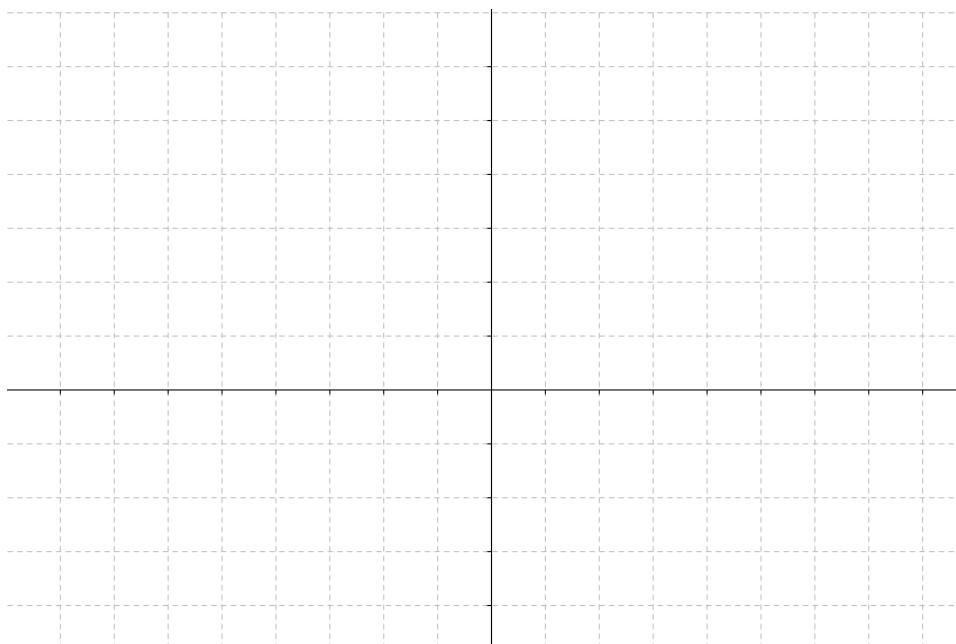
f) What is the sign of $g(x)$ when $x > r$?

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

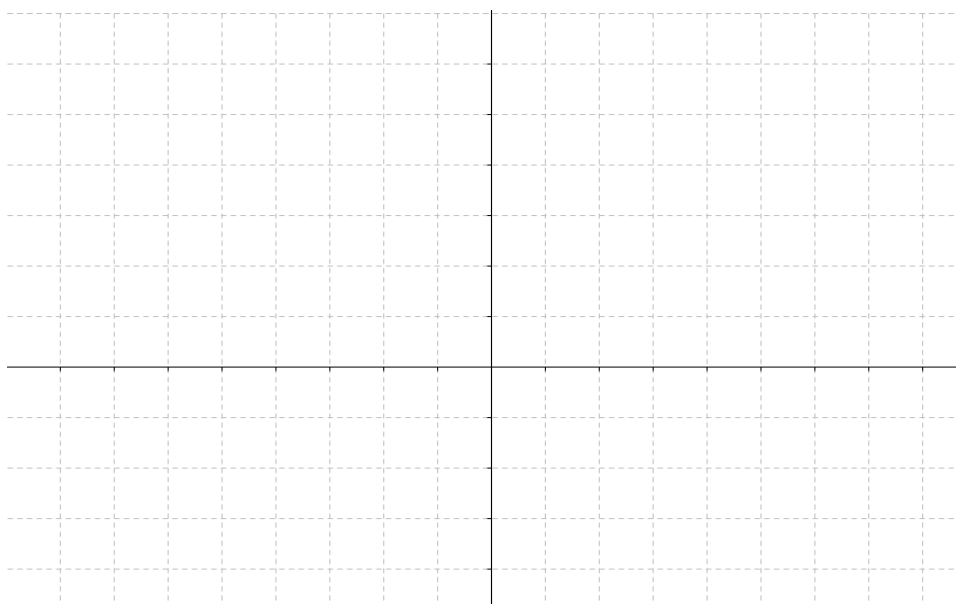
h) Which of the following is the shape of the polynomial when $x > 4$?



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 $x > r$?

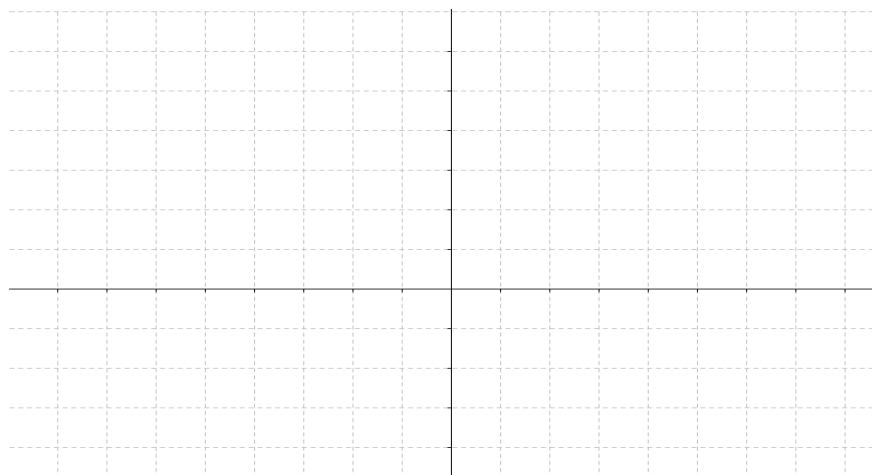
g) Hence is the graph of the polynomial $g(x)$ when $x > r$ increasing or decreasing?

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

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

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

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

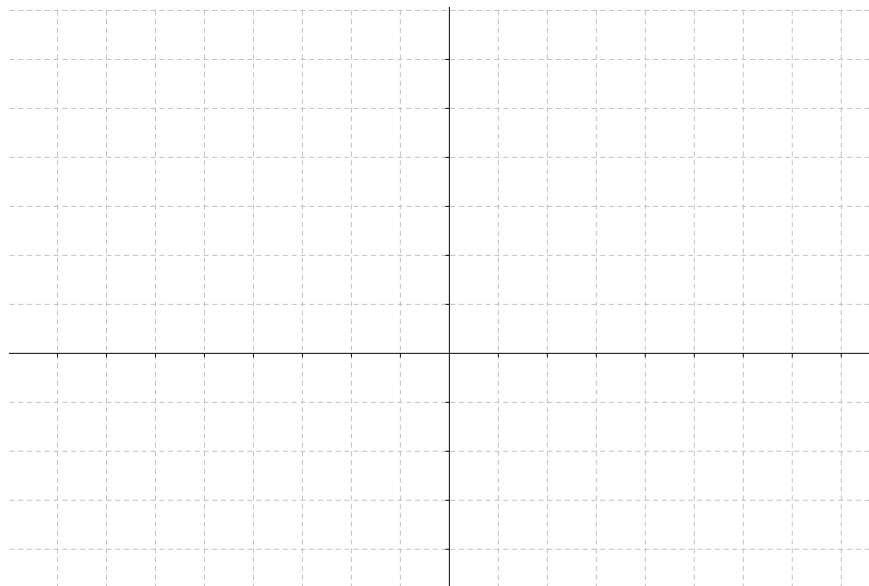
 - Is $g(r+1)$ positive or negative?

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

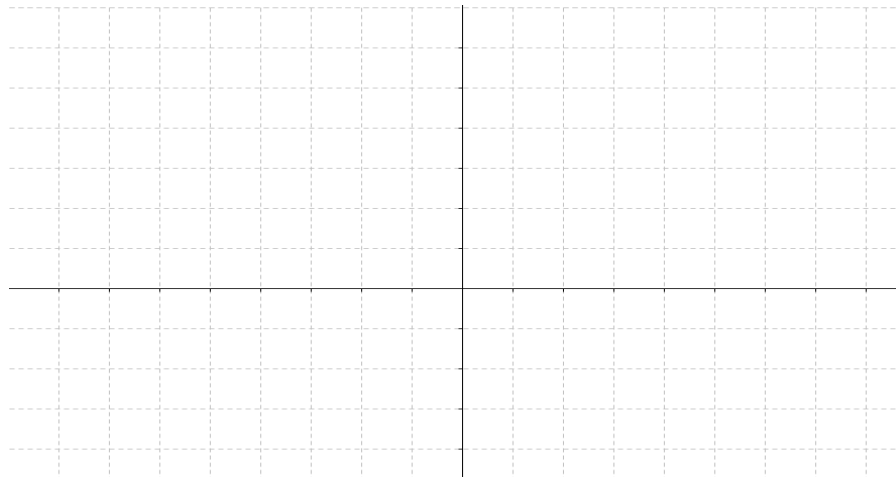
 - Hence is the graph of the polynomial $g(x)$ when $x > r$ increasing or decreasing?

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

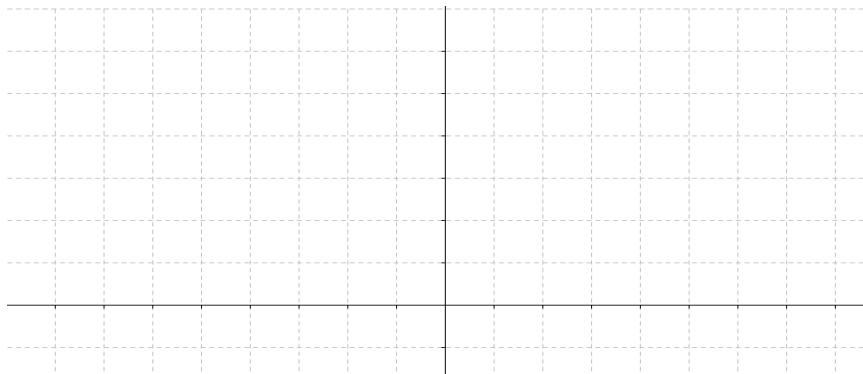
 - Complete a sketch of $y = g(x) = (x+2)(x+1)(x-2)$. Note it is only a sketch and exact heights are not required.



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?

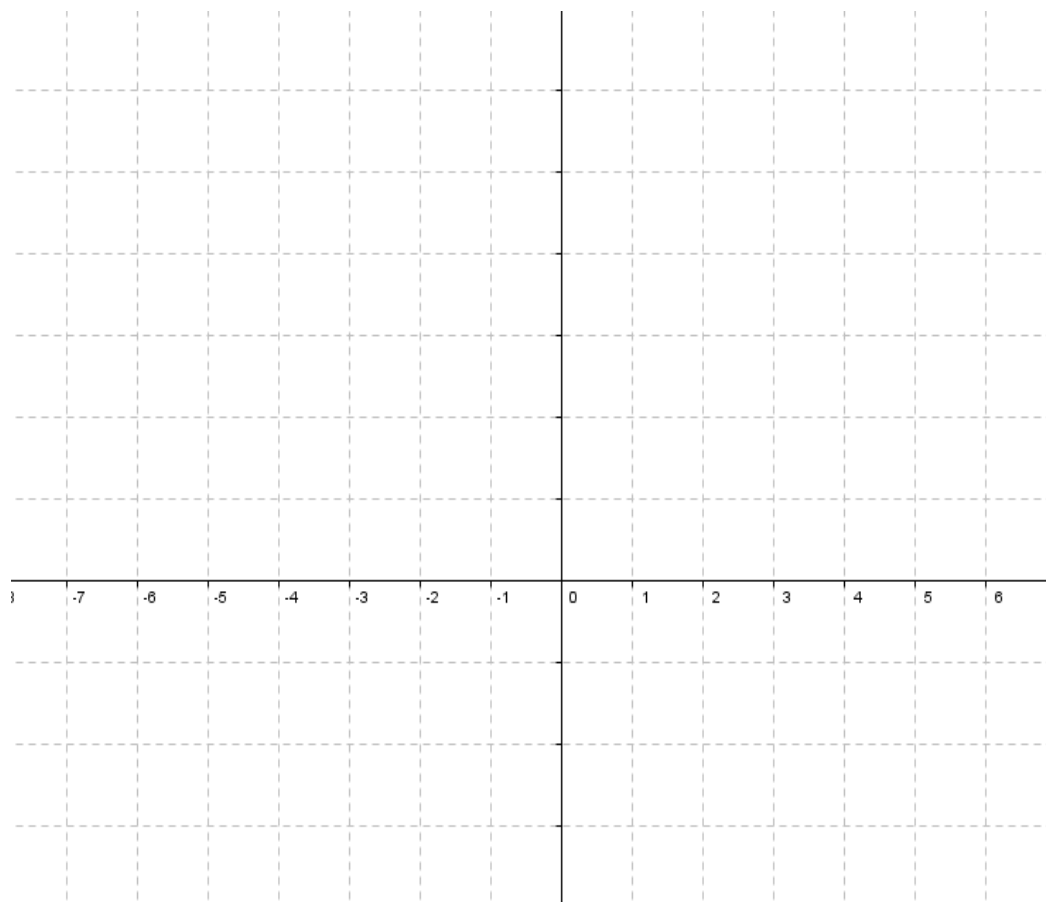
- d. What happens to this graph at 3?

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

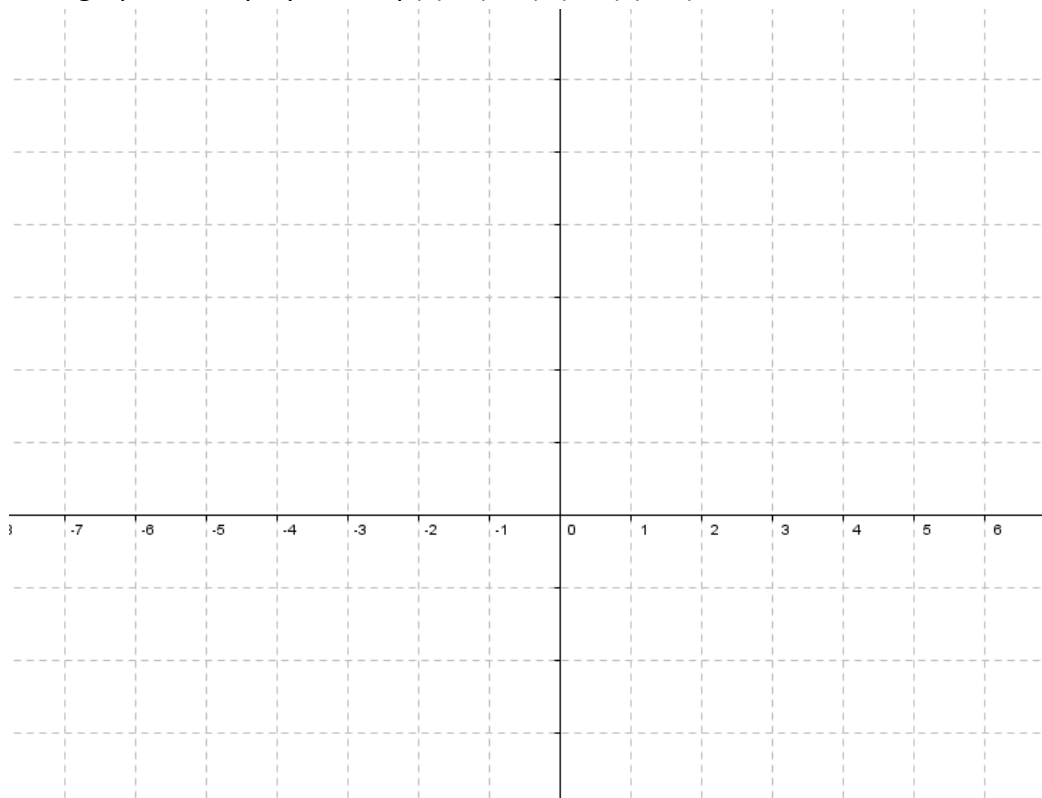
- f. What happens to this graph at 2?

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

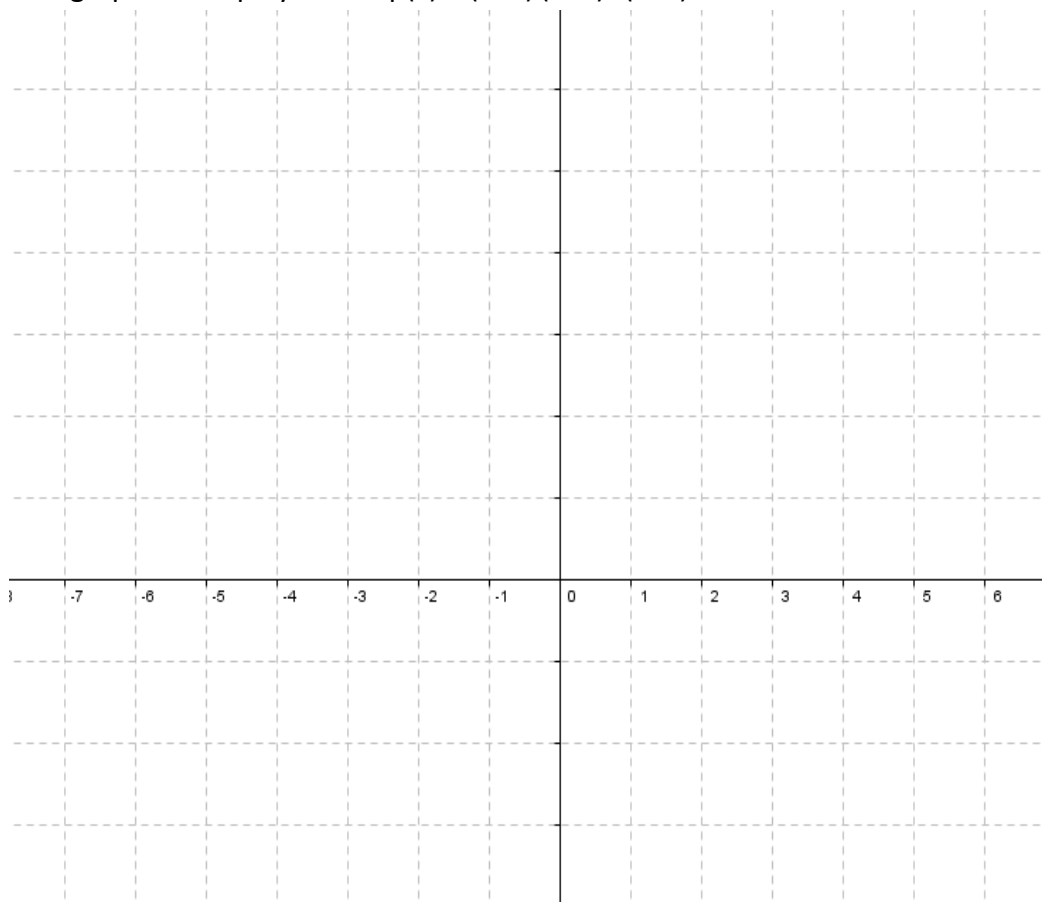
- h. Using the interactive file determine the shape of the graph $h(x) = -g(x)$?



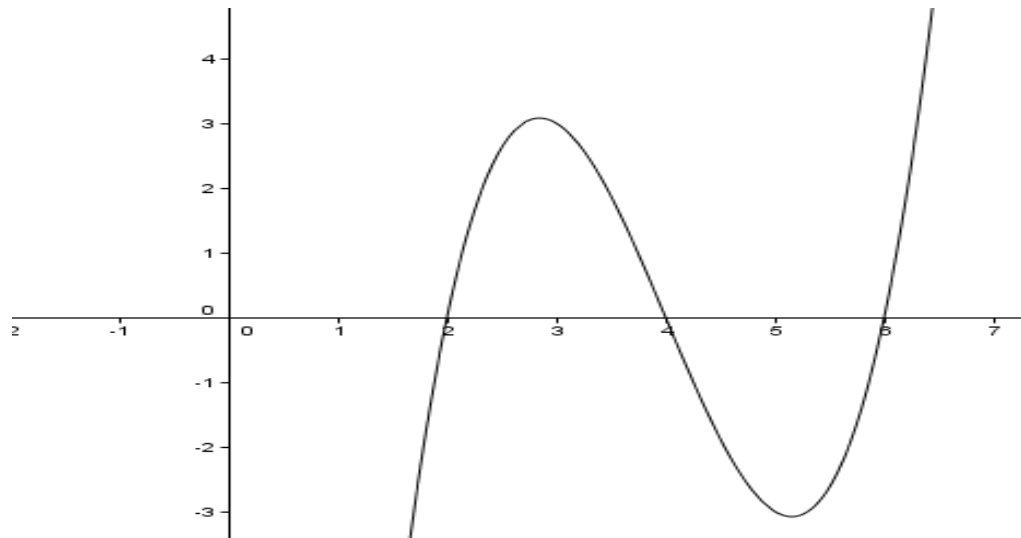
9) Sketch the graph of the polynomial $p(x) = (x-1)^2(x-2)(x-3)$.



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?

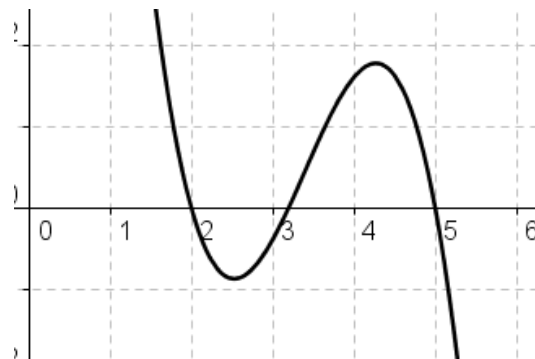
- c. For what values of x is this graph positive and increasing?

- 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?

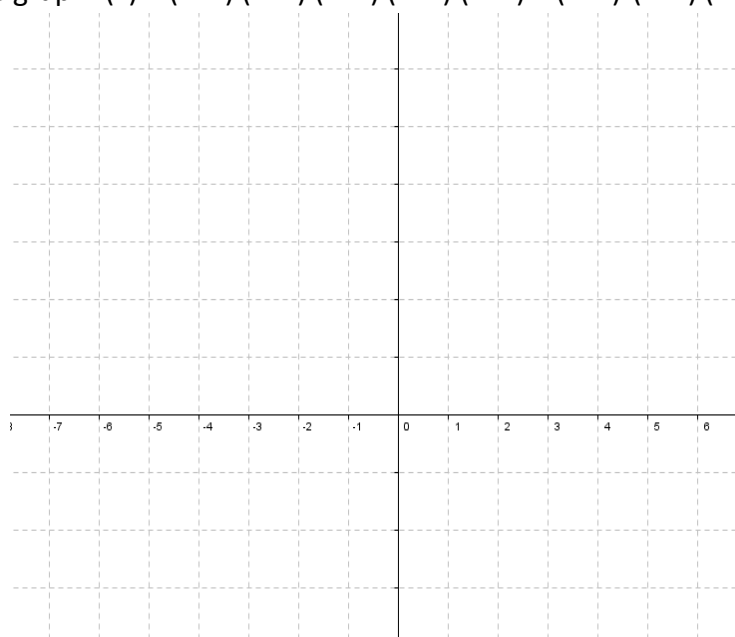
- e. For what values of x is this graph negative and increasing?

- 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.

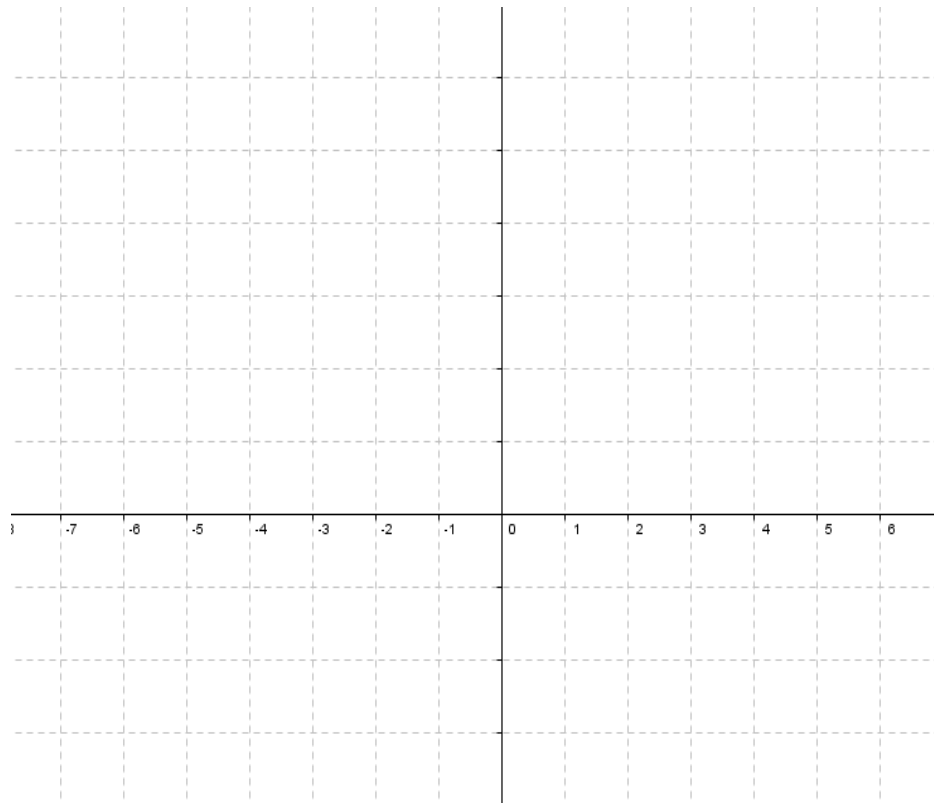
13)

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

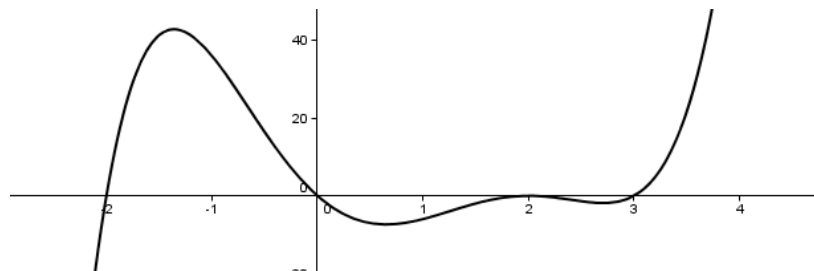


- b. What happens to the graph at $x=2$?

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?

