MATHEMATICAL METHODS CAS
UNIT ONE

POLYNOMIALS

Earlier we saw that you could build up complex polynomials from a series of simpler polynomials.
A real polynomial is of the form:

$$P(x)=a_0+a_1x+a_2x^2+.....+a_nx^n,$$

where each power is a positive integer ($n \in J^+$) and the degree of the polynomial is the highest power of the polynomial.

The first degree polynomial is called a linear function.
The second degree polynomial is called a quadratic function.
The third degree polynomial is called a cubic function.
The fourth degree polynomial is called a quartic function.

Exercise One:

Let $f(x)=3x^2-4x-5$ and $g(x)=x^3-6x^2+8x+2$. Find the rules for the following polynomials.

(i) $-f(x)$ *and* $-g(x)$

(ii) $2f(x)$

(iii) $-3g(x)$

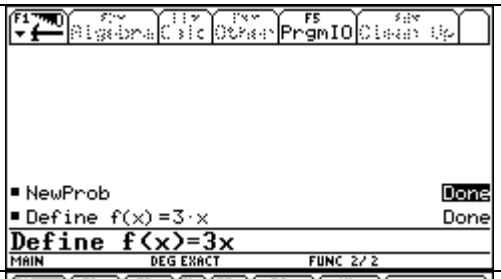
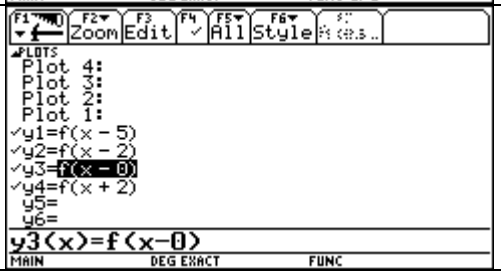
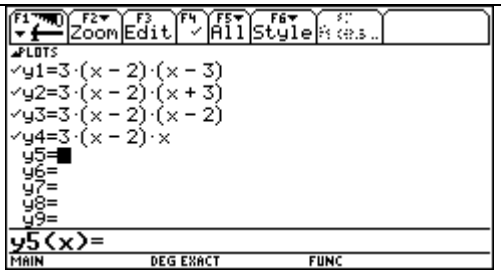
(iv) $f(x)+2g(x)$

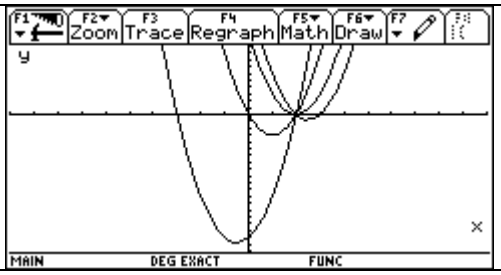
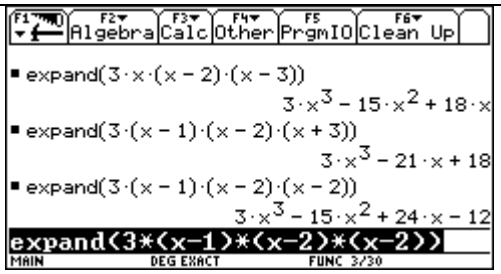
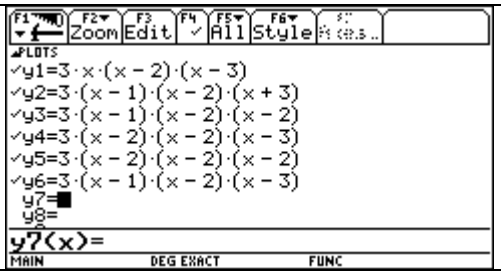
GRAPHS OF POLYNOMIALS

When using the CAS calculator, it is important to include all the key features on the graph. These include:

(i) the axes labelled.
(ii) *x* and *y* intercepts.
(iii) turning points or points of inflexion.
(iv) points of intersection.
(v) if the graph cuts the *x* axis once then a second reference point is necessary.
(vi) asymptotes. (not necessary for polynomials)

Investigating polynomial graphs

On Home screen, NewProb F6 2 Define f(x) = 3x	
Sketch the following functions. f(x-5), f(x-2), f(x-0), f(x+2)	
What are the zeros of these graphs??? What is the relationship between the zeros and the graphs of the function?	
Consider the following quadratic polynomial. What is the degree of these polynomials? Graph the equations as shown in the screen dump on the right.	

You will need to change the window to see all the important feature so the graph.	
What are the zeros of these graphs??? What is the relationship between the zeros and the graphs of the function?	***In your binder book you are to sketch the graphs of each polynomial on a separate set of axes. Label the intercepts with the axes ONLY.***
Consider the following cubic functions. Using the **Expand** key to expand the following. Y = 3x(x – 1)(x – 3) Y= 3(x – 1)(x – 2)(x + 3) Y= 3(x – 1)(x – 2)(x – 2) Y = 3(x – 2)(x – 2)(x -3) Y = 3(x – 2)(x – 2)(x – 2) Y= 3(x –1)(x – 2)(x – 3)	
What is the degree of these polynomials? Graph the equations as shown in the screen dump on the right.	
Graph each equation one at a time. You will need to investigate the number of times the graph cuts the *x* axes. Consider the zeros and the graphs of the functions. What is the relationship between the two?	**<u>NOTE YOUR FINDINGS</u>** ***In your binder book you are to sketch the graphs of each polynomial on a separate set of axes. Label the intercepts with the axes ONLY.***

Consider the following quartic functions.

Using the **Expand** key to expand the following.

Y = 3x(x – 2)(x – 3)(x + 3)

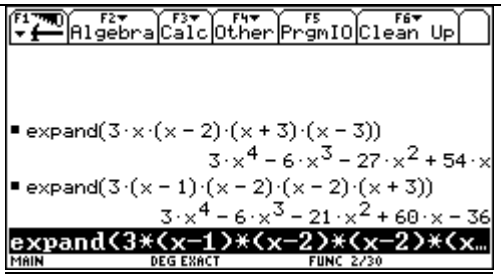
Y= 3(x – 1)(x – 2)(x – 2)(x + 3)

Y= 3(x – 1)(x – 1)(x – 2)(x – 2)

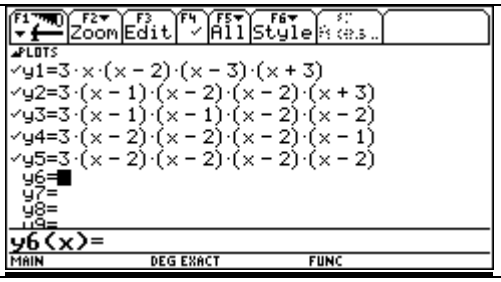
Y = 3(x – 2)(x – 2)(x -2)(x – 1)

Y = 3(x – 2)(x – 2)(x – 2)(x – 2)

What is the degree of these polynomials?



Graph the equations as shown in the screen dump on the right.



Graph each equation one at a time. You will need to investigate the number of times the graph cuts the *x* axes.

Consider the zeros and the graphs of the functions. What is the relationship between the two?

<u>NOTE YOUR FINDINGS</u>

In your binder book you are to sketch the graphs of each polynomial on a separate set of axes. Label the intercepts with the axes ONLY.

<u>What have you found out???</u>