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:

 $P(x) = a_0 + a_1 x + a_2 x^2 + \dots + a_n x^n,$

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)

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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 $f(x) = 3x$	
	NewProb Define f(x) = 3 · x Done Define f(x) = 3 · x Define f(x) = 3 x Main DEG EXACT FUNC 2/ 2
Sketch the following functions. f(x-5), f(x-2), f(x-0), f(x+2)	$\begin{array}{c c c c c c c c c c c c c c c c c c c $
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?	$ \begin{array}{c} f_{2} \\ \hline f_{2} \hline f_{2} \\ \hline f_{2} \\ \hline f_{2} \hline f_{2} \\ \hline f_{2} \hline f_{2$
Graph the equations as shown in the screen dump on the right.	97= 99= 99= 95(x)= Main DEG EXACT FUNC

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?	The provided and the 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?	$ \begin{array}{c} \hline \mathbf{f}_{1}^{2} \hline \mathbf{f}_{2}^{2} \hline \mathbf{f}_{3}^{2} \hline \mathbf{f}_{3}^{2$
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 <i>x</i>	$\frac{1-3}{\sqrt{2}-3} \cdot (x-1) \cdot (x-2) \cdot (x+3)}{\sqrt{2}-3} \cdot (x-1) \cdot (x-2) \cdot (x+3)}$ $\frac{-3}{\sqrt{2}-3} \cdot (x-1) \cdot (x-2) \cdot (x-2)}{\sqrt{2}-3} \cdot (x-2) \cdot (x-2) \cdot (x-3)}$ $\frac{-3}{\sqrt{2}-3} \cdot (x-1) \cdot (x-2) \cdot (x-3)}{\sqrt{2}-3} \cdot (x-1) \cdot (x-2) \cdot (x-3)}$ $\frac{-3}{\sqrt{2}-3} \cdot (x-1) \cdot (x-2) \cdot (x-3)}{\sqrt{2}-3} \cdot (x-1) \cdot (x-2) \cdot (x-3)}$ $\frac{-3}{\sqrt{2}-3} \cdot (x-1) \cdot (x-2) \cdot (x-3)}{\sqrt{2}-3} \cdot (x-3) \cdot (x-3)}$ In vour binder book you are to sketch
axes. Consider the zeros and the graphs of the functions. What is the relationship between the two?	the graphs of each polynomial on a separate set of axes. Label the intercepts with the axes ONLY.

Consider the following quartic	F17700 F2▼ ↓ ← ← Algebra Calc Other PrgmIO Clean UP
functions.	
Using the Expand key to expand the	
following.	• expand($3 \cdot x \cdot (x - 2) \cdot (x + 3) \cdot (x - 3)$) $3 \cdot x^4 = 4 \cdot x^3 = 27 \cdot x^2 + 54 \cdot x^4$
Y = 3x(x-2)(x-3)(x+3)	• expand($3 \cdot (x - 1) \cdot (x - 2) \cdot (x - 2) \cdot (x + 3)$)
Y = 3(x - 1)(x - 2)(x - 2)(x + 3)	$3 \cdot x^4 - 6 \cdot x^3 - 21 \cdot x^2 + 60 \cdot x - 36$
Y = 3(x - 1)(x - 1)(x - 2)(x - 2)	expand(3*(x-1)*(x-2)*(x-2)*(x MAIN DEG EXACT FUNC 2/30
Y = 3(x - 2)(x - 2)(x - 2)(x - 1)	
Y = 3(x - 2)(x - 2)(x - 2)(x - 2)	
What is the decree of these relevanticle?	
what is the degree of these polynomials?	
Graph the equations as shown in the	Zoom Edit / All Style Process.
screen dump on the right.	$\sqrt{91=3} \cdot x \cdot (x-2) \cdot (x-3) \cdot (x+3)$ $\sqrt{92=3} \cdot (x-1) \cdot (x-2) \cdot (x-2) \cdot (x+3)$
	$\sqrt{9}3=3\cdot(x-1)\cdot(x-1)\cdot(x-2)\cdot(x-2)$
	$y_{y_{z_{z_{z_{z_{z_{z_{z_{z_{z_{z_{z_{z_{z_$
	90- 97- 98-
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Crark ask agreeting and at a time	MAIN DEGENACT FUNC
Graph each equation one at a time.	NOTE YOUR FINDINGS
number of times the graph outs the r	
number of times the graph cuts the λ	
axs.	In your hinder book you are to sketch
Consider the zeros and the graphs of the	the graphs of each polynomial on a
functions What is the relationship	separate set of axes. Label the intercents
between the two?	with the ares ONLY
	What have you found out???
	<u>What have you found out???</u>