MHF4U
Quiz Chapter 3

Name SOLUTIONS
Date Aug 21, 2017

Note. Show your work to get full marks.

1. Given is the polynomial function $f(x) = 2x^2(9 - x^2)$.

a) Expand and find the leading and the constant term. [K 2]

$f(x) = -2x^4 + 18x^2$

$LT = -2x^4$

$CT = 0$

b) Find if the polynomial function is even, odd, or neither. [K 2]

Exponents : 4 and 2 (all even)

f is even

c) Factorize and find its zeros and their multiplicities (orders). [K 2]

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

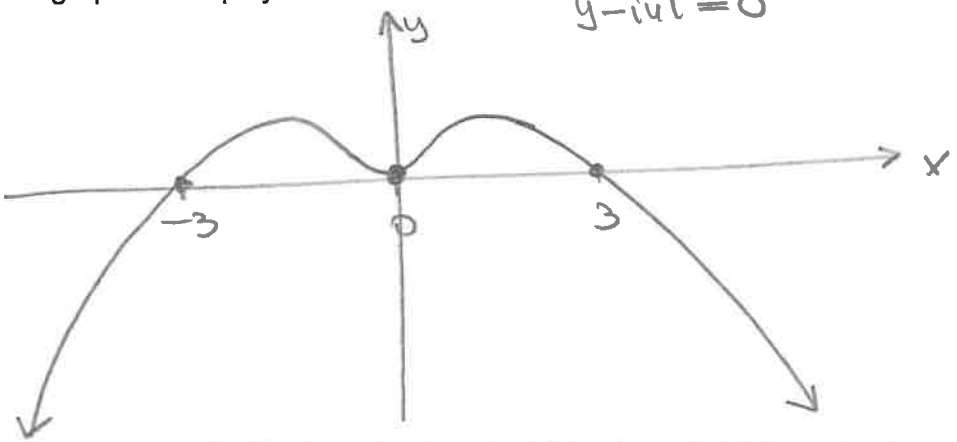
$x_1 = 0 \; ; \; m_1 = 2$

$x_2 = 3 \; ; \; m_2 = 1$

$x_3 = -3 \; ; \; m_3 = 1$

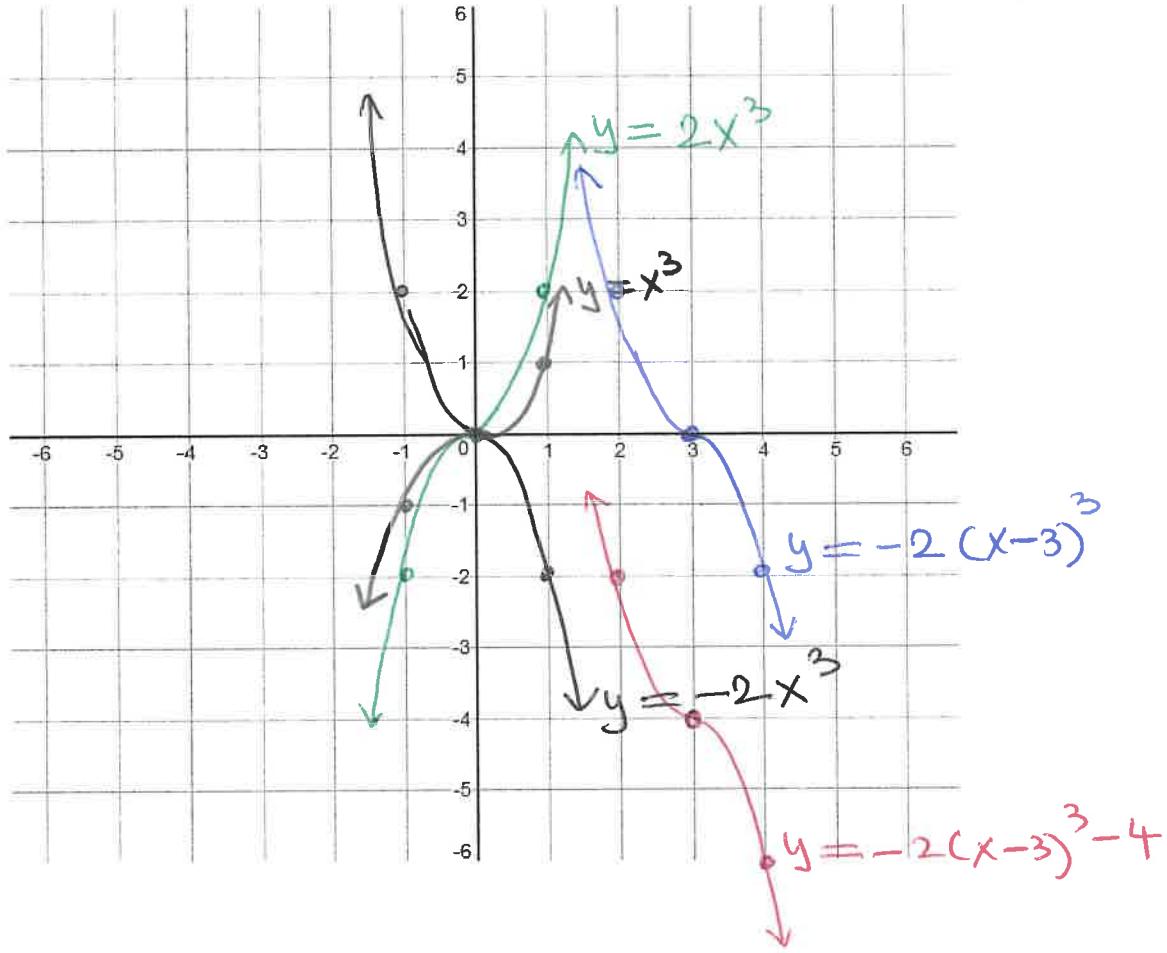
d) Sketch the graph of this polynomial function. [T 2]

y-int = 0



2. Use transformations to graph $f(x) = 2(3-x)^3 - 4$ [A 4]

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



3. Classify the following relation as linear, quadratic, cubic or quartic. Explain. [C 3]

x	y	Δ_1	Δ_2	Δ_3	Δ_4
-3	-138				
		112			
-2	-26		-88		
		24		66	
-1	-2		-22		-48
		2		18	
0	0		-4		-48
		-2		-30	
1	-2		-34		-48
		-36		-78	
2	-38		-112		
		-148			
3	-186				

Fourth order differences are constant

$\therefore n = 4$ (quartic)

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Name .....
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Note. Show your work to get full marks.

1. Given is the polynomial function $f(x) = -x(x^2-1)^2$.

a) Expand and find the leading and the constant term. [K 2]

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

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

$LT = -x^5$

$cT = 0$

b) Find if the polynomial function is even, odd, or neither. [K 2]

Exponents of x : 5, 3, 1 (all odd)

f is odd

c) Factorize and find its zeros and their multiplicities (orders). [K 2]

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

$x_1 = 0$; $m_1 = 1$

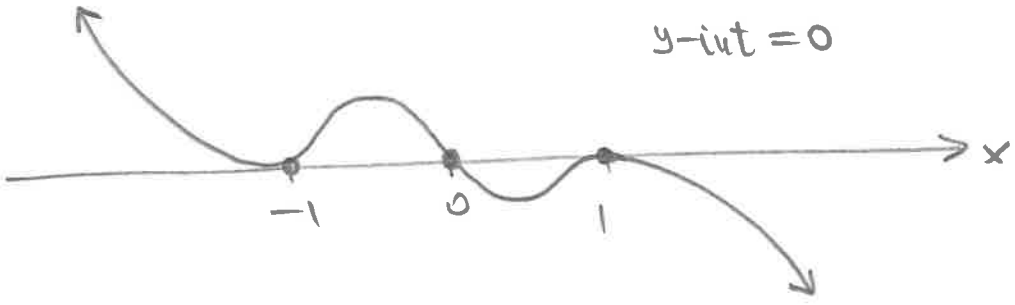
$x_2 = 1$; $m_2 = 2$

$x_3 = -1$; $m_3 = 2$

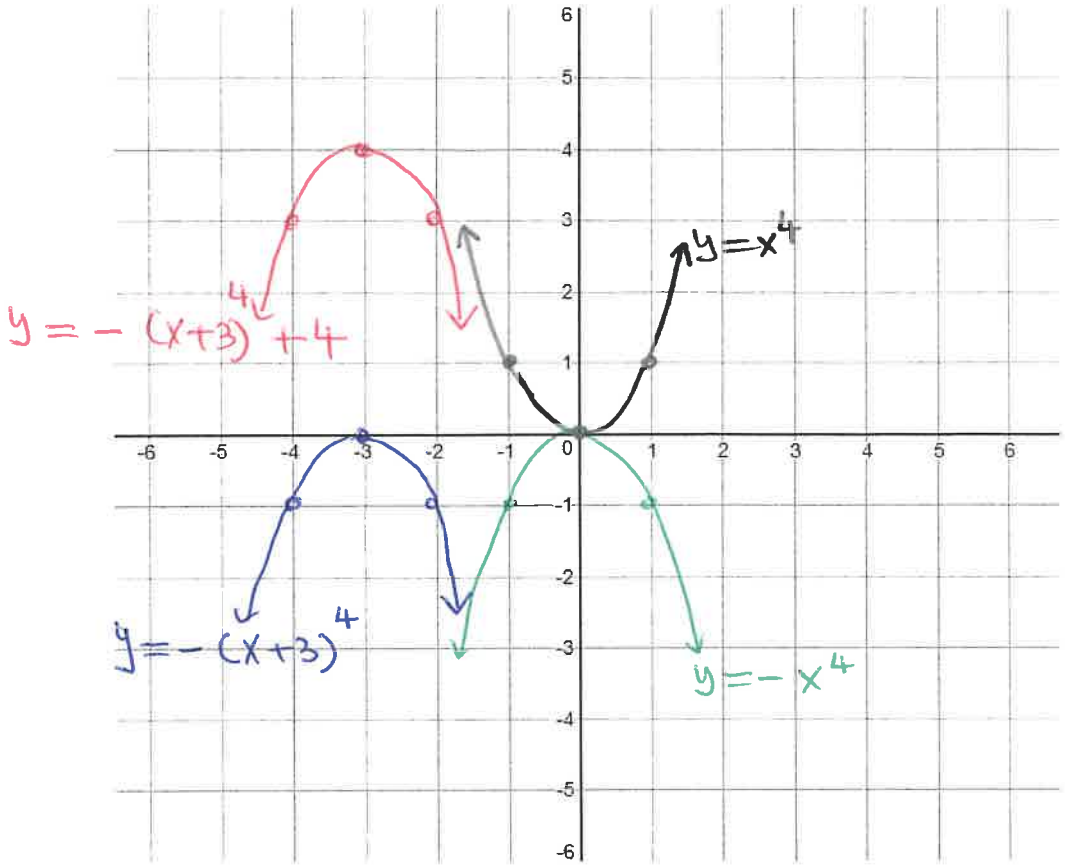
d) Sketch the graph of this polynomial function. [T 2]

$LC = -1 < 0$

y-int $= 0$



2. Use transformations to graph $f(x) = -(x+3)^4 + 4$ [A 4]



3. Classify the following relation as linear, quadratic, cubic or quartic. Explain. [C 3]

x	y	Δ_1	Δ_2	Δ_3
-3	55			
		-35		
-2	20		18	
		-17		-6
-1	3		12	
		-5		-6
0	-2		6	
		1		-6
1	-1		0	
		1		-6
2	0		-6	
		-5		
3	-5			

Third order differences are constant

$\therefore n = 3$

Relation is Cubic

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Quiz Chapter 3

Name .....
Date Aug 20, 2018

Note. Show your work to get full marks.

$4x^2 - 2x^3 - 16 + 8x$

1. Given is the polynomial function $f(x) = (x^2 - 4)(4 - 2x)$.

a) Expand and find the leading and the constant term. [K 2]

$f(x) = -2x^3 + 4x^2 + 8x - 16$

$LT = -2x^3$

$CT = -16$

b) Find if the polynomial function is even, odd, or neither. [K 2]

f is neither odd nor even
(even and odd exponents of x)

c) Factorize and find its zeros and their multiplicities (orders). [K 2]

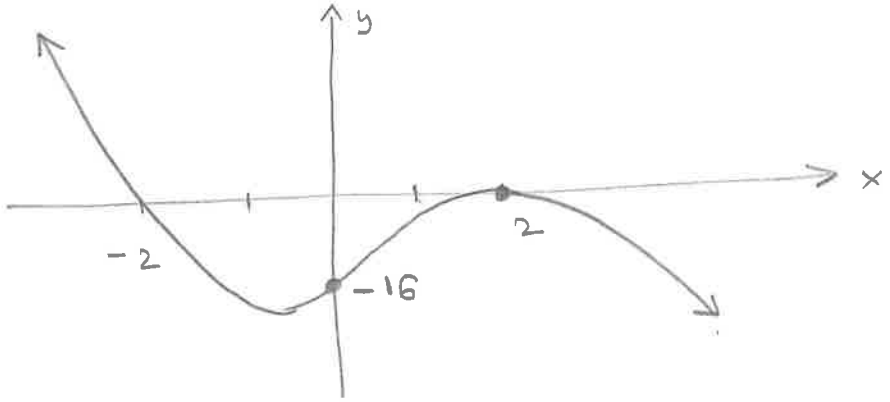
$f(x) = (x-2)(x+2)(2)(2-x)$

$= -2(x-2)^2(x+2)$

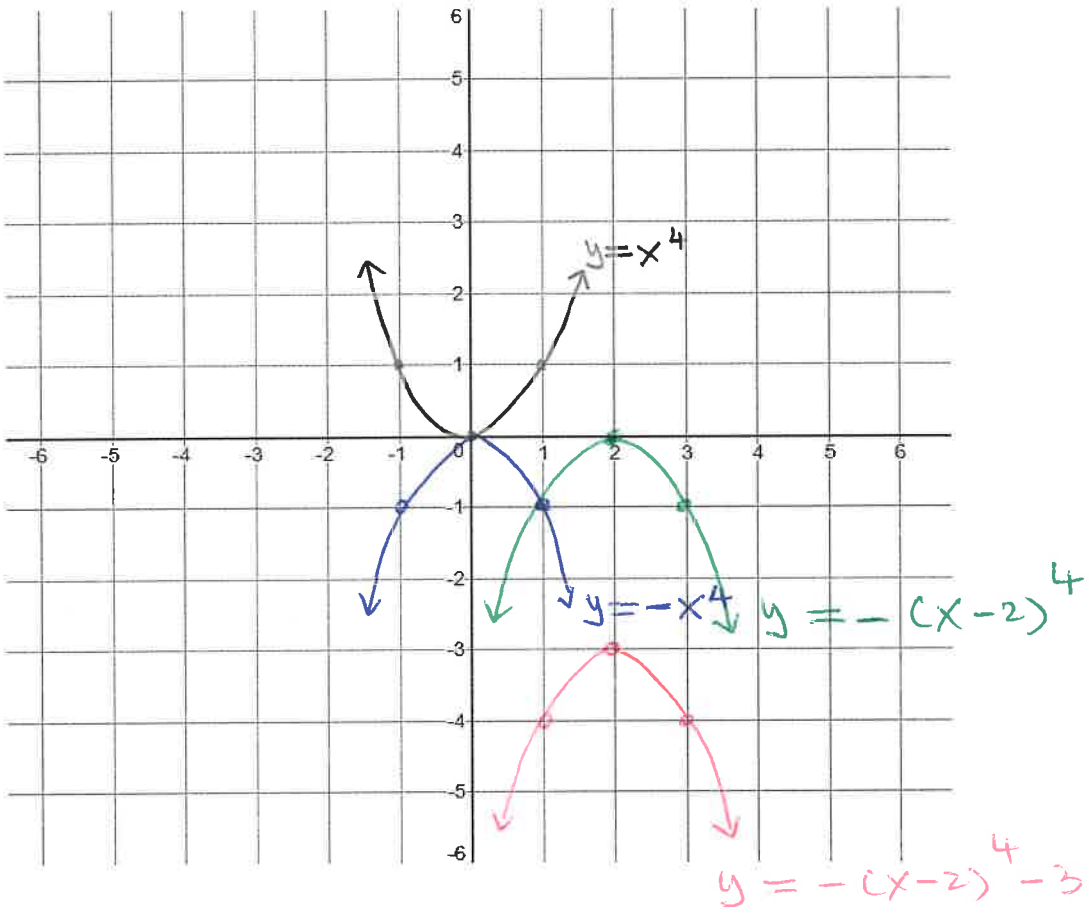
$x_1 = 2$; $m_1 = 2$

$x_2 = -2$; $m_2 = 1$

d) Sketch the graph of this polynomial function. [T 2]



2. Use transformations to graph $f(x) = -(x-2)^4 - 3$ [A 4]



3. Classify the following relation as linear, quadratic, cubic or quartic. Explain. [C 3]

x	y	Δ^1	Δ^2	Δ^3
-3	60			
		-42		
-2	18		26	
		-16		-12
-1	2		14	
		-2		-12
0	0		2	
		0		-12
1	0		-10	
		-10		-12
2	-10		-22	
		-32		
3	-42			

$n = 3$

cubic

constant

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Quiz Chapter 3

Name .....
Date Aug 20, 2018

Note. Show your work to get full marks.

1. Given is the polynomial function $f(x) = (x+1)^2(1-x^2) = (x^2+2x+1)(1-x^2)$

a) Expand and find the leading and the constant term. [K 2]

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

$= -x^4 - 2x^3 + 2x + 1$

LT $= -x^4$

CT $= 1$

b) Find if the polynomial function is even, odd, or neither. [K 2]

neither

(odd and even exponents of x)

c) Factorize and find its zeros and their multiplicities (orders). [K 2]

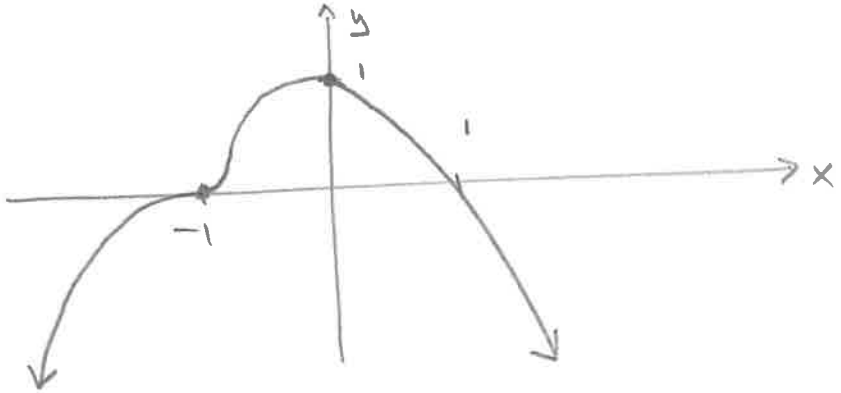
$f(x) = (x+1)^2(1-x)(1+x)$

$= -(x-1)(x+1)^3$

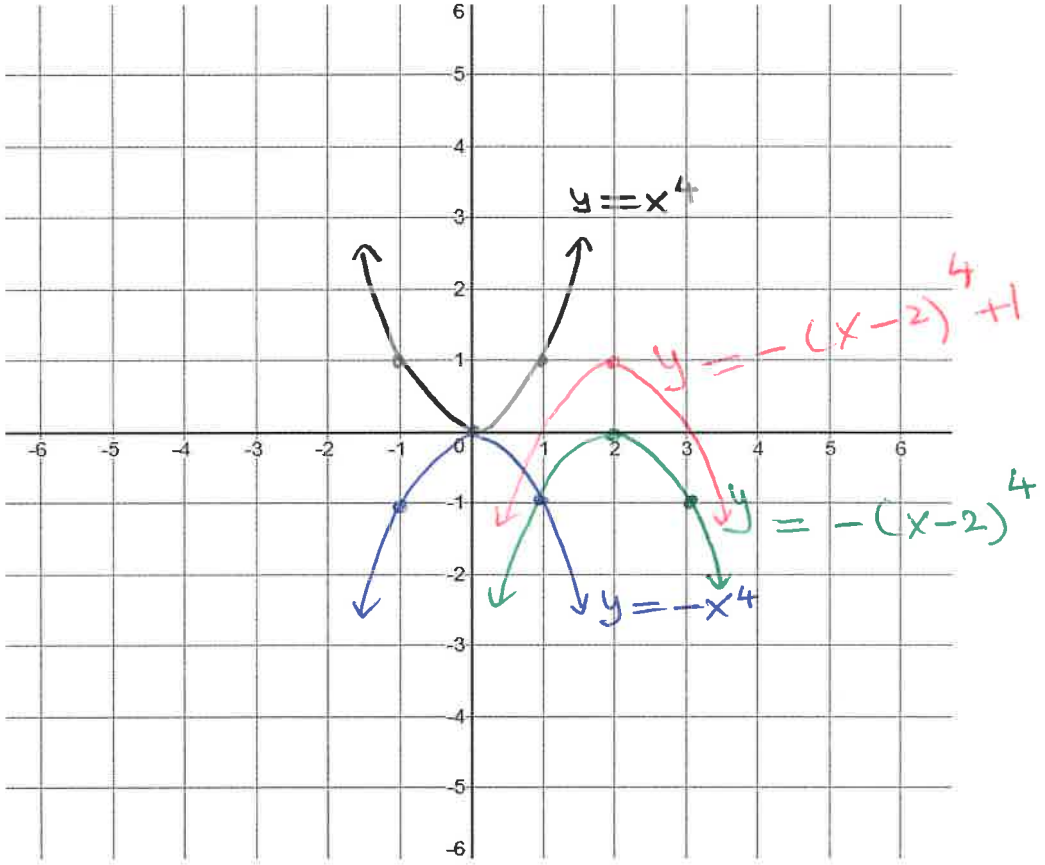
$x_1 = 1$; $w_1 = 1$

$x_2 = -1$; $w_2 = 3$

d) Sketch the graph of this polynomial function. [T 2]



2. Use transformations to graph $f(x) = -(x-2)^4 + 1$ [A 4]



3. Classify the following relation as linear, quadratic, cubic or quartic. Explain. [C 3]

x	y	Δ^1	Δ^2	Δ^3	Δ^4
-3	-120				
		90			
-2	-30		-64		
		26		42	
-1	-4		-22		-24
		4		18	
0	0		-4		-24
		0		-6	
1	0		-10		-24
		-10		-30	
2	-10		-40		
		-50			
3	-60				

constant

$n = 4$

∴ quartic

MHF4U

Name .....
Due Date: Monday Aug 29, 2016

Assignment: Polynomial Functions

1. Find the quotient and the remainder. Show your work. [K/U 4]

a) $\frac{2x^5-3x^2+1}{x^3-x-2}$

$$
\begin{array}{r|l}
x^3-x-2 & 2x^2+2 \\
\hline
 & 2x^5-3x^2+1 \\
 & 2x^5-2x^3-4x^2 \\
\hline
 & 2x^3+x^2+1 \\
 & 2x^3-2x-4 \\
\hline
 & x^2+2x+5
\end{array}
$$

$\therefore q(x) = 2x^2+2$

$r(x) = x^2+2x+5$

2. Show that $x+2$ is not a factor of the polynomial $P(x) = 2x^4+x^3-x+1$ by using two different methods. Explain. [C 4]

By using Synthetic Division

$$
\begin{array}{r|ccccc}
-2 & 2 & 1 & 0 & -1 & 1 \\
 & 0 & -4 & 6 & -12 & 26 \\
\hline
 & 2 & -3 & 6 & -13 & 27
\end{array}
$$

$r = 27 \neq 0$

$\therefore$ $x+2$ is not a factor of $P(x)$

By using Remainder Theorem

$r = P(-2)$

$= 2(-2)^4+(-2)^3-(-2)+1$

$= 32-8+2+1$

$= 27 \neq 0$

$\therefore$ -2 is not a zero

$x+2$ is not a factor of $P(x)$

3. Factor completely. Show your work. [A 4]

$P(x) = x^4 - 2x^3 - 3x^2 + 6x$

$= x(x^3 - 2x^2 - 3x + 6)$

Set of factors of 6 is

$\{\pm 1, \pm 2, \pm 3, \pm 6\}$

$f(x) = x^3 - 2x^2 - 3x + 6$

$f(2) = 0$

2	1	−2	−3	6
		2	0	−6
	1	0	−3	0

$P(x) = x(x-2)(x^2-3)$

$\therefore P(x) = x(x-2)(x-\sqrt{3})(x+\sqrt{3})$

4. Graph the polynomial function. Find all the local and global extrema. [T 4]

$P(x) = x^4 - x^2 + \frac{1}{4}$

$P(x) = \left(x^2 - \frac{1}{2}\right)^2$

$= \left(x - \frac{1}{\sqrt{2}}\right)^2 \left(x + \frac{1}{\sqrt{2}}\right)^2$

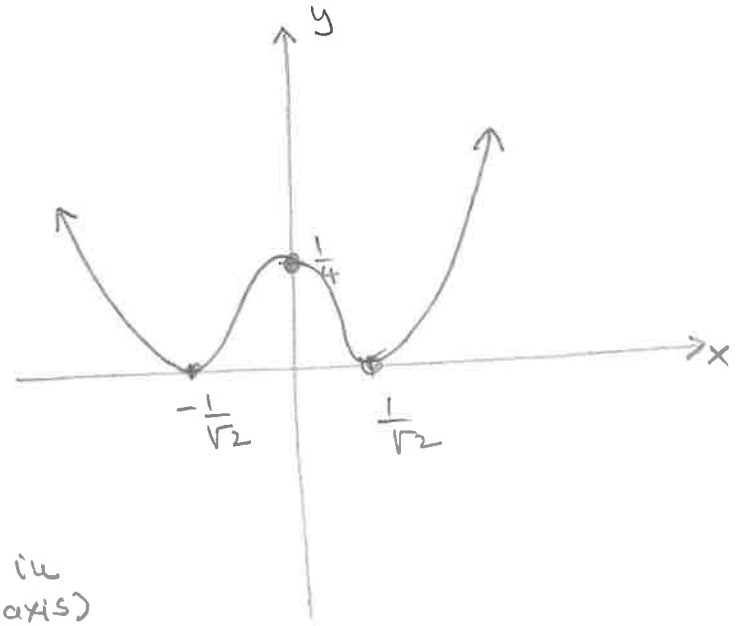
Zeros:

$x_1 = \frac{1}{\sqrt{2}}$; $m_1 = 2$

$x_2 = -\frac{1}{\sqrt{2}}$; $m_2 = 2$

$P(x)$ is even (symmetry in y-axis)

$P(0) = \frac{1}{4}$



$\therefore$ Local maximum at $(0, \frac{1}{4})$ $\therefore$ Global maximum : none

$\therefore$ Local minima at $(\pm\frac{1}{\sqrt{2}}, 0)$ $\therefore$ Global minima at $(\pm\frac{1}{\sqrt{2}}, 0)$