Algebra 2 Worksheet — Name: Key
Combo Day! Sections 6.5–6.7, 6.9 — Period: ____

I. Use finite differences to determine the degree of the polynomial that best describes the data.

1.

x	y
-5	-20
-4	-19
-3	-9
-2	5.5
-1	20
0	30

1st: +1, +10, +14.5, +14.5, +10
2nd: +9, +4.5, +0, −4.5
3rd: −4.5, −4.5, −4.5

cubic

2.

x	y
-2	-2
-1	-6
0	0
1	10
2	20
3	28

1st: −4, +6, +10, +10, +8
2nd: +10, +4, +0, −2
3rd: −6, −4, −2
4th: +2, +2

Cubic

3.

x	y
-2	-3
-1	1
0	4.3
1	6.9
2	8.8
3	10

1st: +4, +3.3, +2.6, +1.9, +1.2
2nd: −0.7, −0.7, −0.7, −0.7

quadratic

II. Application.

4. The table below shows the number of Canadian visitors to the United States. Use a polynomial model to predict the number of visitors in 2006.

years since 1996: 0, 2, 4, 5, 6, 7 — x (L_1)

Year	1996	1998	2000	2001	2002	2003
Visitors (in millions)	15.3	13.4	14.6	13.5	13.0	12.7

y (L_2)

2006 → 10 years since 1996

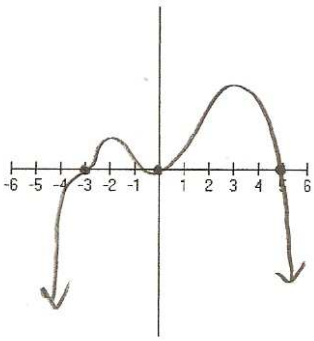
Linear: $r \approx -.7996$
Quad: $r^2 \approx .6396$
Cubic: $r^2 \approx .7825$
quartic: $r^2 \approx .9685$

$y \approx 0.03x^4 - 0.50x^3 + 2.45x^2 - 4.09x + 15.29$

$x = 10 \rightarrow y \approx$ 42.1 million

III. Sketch a graph of each function WITHOUT using the calculator and find the requested info.

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



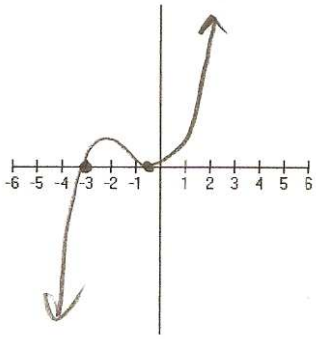
Root	Multiplicity
Ex. 0	2
−3	3
5	1

2+3+1 = 6

Degree of the Polynomial: 6

End Behavior:
$x \to -\infty,\ y \to$ $-\infty$
$x \to +\infty,\ y \to$ $-\infty$

6. $y \overset{+}{=} (2x+1)^2(x+3)$



Root	Multiplicity
$-\frac{1}{2}$	2
−3	1

2+1 = 3

Degree of the Polynomial: 3

End Behavior:
$x \to -\infty,\ y \to$ $-\infty$
$x \to +\infty,\ y \to$ $+\infty$

IV. Find the requested information for each polynomial graph. All polynomials are in standard form.

7. $P(x) = 8x^6 - 5x^5 + \ldots + x^2 - 10$

Leading Coefficient: 8

Degree: 6 y-intercept: -10

Total Number of Roots: 6

End Behavior: positive even

$x \to -\infty,\ y \to$ $+\infty$

$x \to +\infty,\ y \to$ $+\infty$

$\uparrow, \uparrow$

8. $P(x) = -2x^9 + 4x^8 + \ldots + 6x + 2$

Leading Coefficient: -2

Degree: 9 y-intercept: 2

Total Number of Roots: 9

End Behavior: negative odd

$x \to -\infty,\ y \to$ $+\infty$

$x \to +\infty,\ y \to$ $-\infty$

$\uparrow, \downarrow$

V. Solve each of the polynomial equations by factoring to start...

9. $x^3 + 5x^2 - 27x - 135 = 0$

$x^2(x+5) - 27(x+5) = 0$

$(x+5)(x^2-27) = 0$

$x+5=0$ $\quad$ $x^2-27=0$

$x=-5$ $\quad$ $\sqrt{x^2} = \sqrt{27}$

$x = \pm 3\sqrt{3}$

$\boxed{x = -5,\ \pm 3\sqrt{3}}$

10. $x^4 - 7x^2 = 144$

$x^4 - 7x^2 - 144 = 0$

$(x^2-16)(x^2+9) = 0$

$x^2 - 16 = 0$ $\quad$ $x^2 + 9 = 0$

$\sqrt{x^2} = \sqrt{16}$ $\quad$ $\sqrt{x^2} = \sqrt{-9}$

$x = \pm 4$ $\quad$ $x = \pm 3i$

$\boxed{x = \pm 4,\ \pm 3i}$

VI. Find all of the roots. Give EXACT VALUES. You may use the calculator to help in your search.

11. $x^3 - 2x^2 - 41x - 56 = 0$

from calc: root @ 8

8	1	-2	-41	-56
		8	48	56
	1	6	7	0

$x^2 + 6x + 7 = 0$

$x = \dfrac{-6 \pm \sqrt{36 - 4(7)}}{2}$

$x = \dfrac{-6 \pm \sqrt{8}}{2}$

$x = \dfrac{-6 \pm 2\sqrt{2}}{2}$

$x = -3 \pm \sqrt{2}$

$\boxed{x = 8,\ -3 \pm \sqrt{2}}$

12. $2x^4 - x^3 + 95x^2 = 49x + 147$

$2x^4 - x^3 + 95x^2 - 49x - 147 = 0$

from calc: roots @ $\frac{3}{2}$, -1

-1	2	-1	95	-49	-147
		-2	3	-98	147
	2	-3	98	-147	0

$\frac{3}{2}$	2	-3	98	-147
		3	0	147
	2	0	98	0

$2x^2 + 98 = 0$

$2x^2 = -98$

$\sqrt{x^2} = \sqrt{-49}$

$x = \pm 7i$

$\boxed{x = -1,\ \frac{3}{2},\ \pm 7i}$