Advanced Algebra (H)
Chapter: Polynomial Functions
Lesson 1: Practice Problems

Date KEY

I. Decide if each is a polynomial function. If so, write in standard form. Then state its degree, type and leading coefficient.

	Function	Standard form	degree	type	LC
1.	$P(x) = x + 2x^{-2} + 9.5$	NO! Not a function			
2.	$q(x) = x + 2x^3 + 3x^4$	Yes, $q(x) = 3x^4 + 2x^3 + x$	4	quartic	3
3.	$f(x) = -3x + 5x^3 - 6x^2 + 2$	Yes, $f(x) = 5x^3 - 6x^2 - 3x + 2$	3	cubic	5
4.	$p(x) = \frac{1}{2}x^2 + 3x - 4x^3 + 6x^4 - 1$	Yes, $p(x) = 6x^4 - 4x^3 + \frac{1}{2}x^2 + 3x - 1$	4	quartic	6
5.	$f(x) = 9x^4 + 8x^3 - 6x^{-2} + 2x$	NO! Not a function			
6.	$g(x) = \sqrt{3} - 12x + 13x^2$	Yes, $g(x) = 13x^2 - 12x + \sqrt{3}$	2	quadratic	13
7.	$h(x) = \frac{5}{3}x^2 - \sqrt{7}x^4 + 8x^3 - \frac{1}{2} + x$	Yes, $h(x) = -\sqrt{7}x^4 + 8x^3 + \frac{5}{3}x^2 + x - \frac{1}{2}$	4	quartic	$-\sqrt{7}$
8.	$h(x) = 3x^4 + 2x - \frac{5}{x} + 9x^3 - 7$	Not a function b/c			

II. Describe the end behavior of the graph of the function without relying on your calculator. Do not sketch the graph. Check your notes if you don't remember. You may use your calculator to check your description.

17. $h(x) = -5x^4 + 7x^3 - 6x^2 + 9x + 2$ (degree)

As $x \to +\infty$, $h(x) \to -\infty$
As $x \to -\infty$, $h(x) \to -\infty$

18. $g(x) = 7x^7 + 12x^5 - 6x^3 - 2x - 18$ (degree, + LC)

As $x \to +\infty$, $g(x) \to +\infty$
As $x \to -\infty$, $g(x) \to -\infty$

19. $f(x) = -2x^4 + 12x^8 + 17 + 15x^2$ (degree)

$f(x) = 12x^8 - 2x^4 + 15x^2 + 17$
As $x \to +\infty$, $f(x) \to +\infty$
As $x \to -\infty$, $f(x) \to +\infty$

20. $f(x) = 11 - 18x^2 - 5x^5 + 12x^4 - 2x$

$f(x) = -5x^5 - 12x^4 - 18x^2 - 2x + 11$
As $x \to +\infty$, $f(x) \to -\infty$
As $x \to -\infty$, $f(x) \to +\infty$

23. **USING STRUCTURE** Determine whether the function is a polynomial function. If so, write it in standard form and state its degree, type, and leading coefficient.

$f(x) = 5x^3x + \frac{5}{2}x^3 - 9x^4 + \sqrt{2}x^2 + 4x - 1 - x^{-5}x^5 - 4$ (simplify)

$5x^4 - 9x^4$

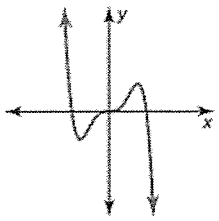
$-x^0$
-1

$f(x) = -4x^4 + \frac{5}{2}x^3 + \sqrt{2}x^2 + 4x - 6$

A function.
Degree = 4
Type = quartic
LC = -4

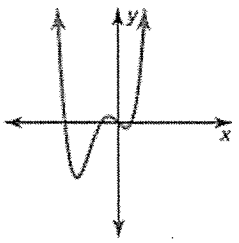
III. Describe the degree and the leading coefficient of the polynomial function for each graph.

21.



odd degree
negative LC

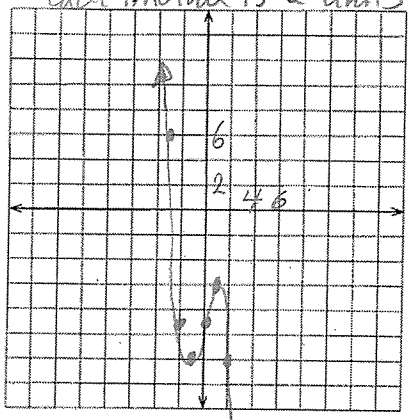
22.



even degree
positive LC

IV. Graph each polynomial function by using a table of value

each interval is 2 units

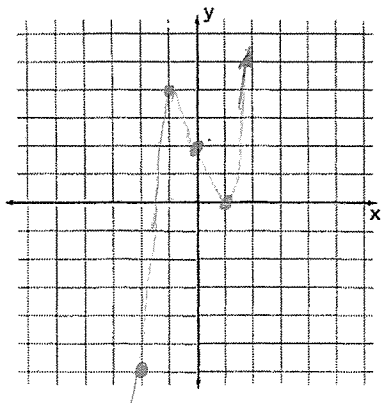


27. $f(x) = 4x - 9 - x^3$ → $-x^3+4x-9$

x	f(x)	
-3	6	
-2	-9	
-1	-12	-4-9+1
0	-9	
1	-6	4-9-1
2	-9	8-9-8

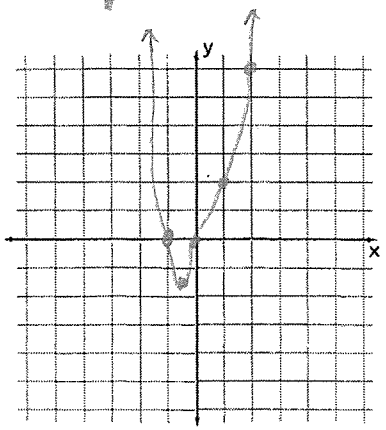
28. $p(x) = x^5 - 3x^3 + 2$

x	p(x)	
-2	-6	-32+24+2
-1	4	-1+3+2
0	2	
1	0	1-3+2
2	10	32-24+2



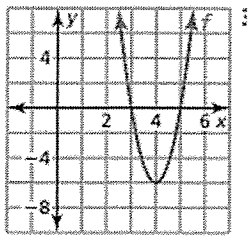
29. $h(x) = x^4 - 2x^3 + 3x$

x	h(x)	
-2	26	16+16-6
-1	0	1+2-3
-.5	-1.6875	
0	0	
1	2	1-2+3
2	6	16-16+6



V. Describe the intervals (x-values) for which the function is a) increasing, b) decreasing, c) $f(x) > 0$, and d) $f(x) < 0$.

33.

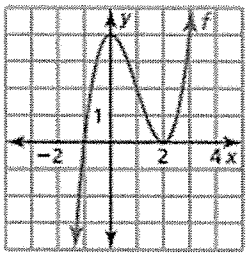


a)Inc $(4, \infty)$

b)Dec $(-\infty, 4)$

c) $(-\infty, 3) \cup (5, \infty)$ d) $(3, 5)$

35.



a)Inc $(-\infty, 0) \cup (2, \infty)$

b)Dec $(0, 2)$

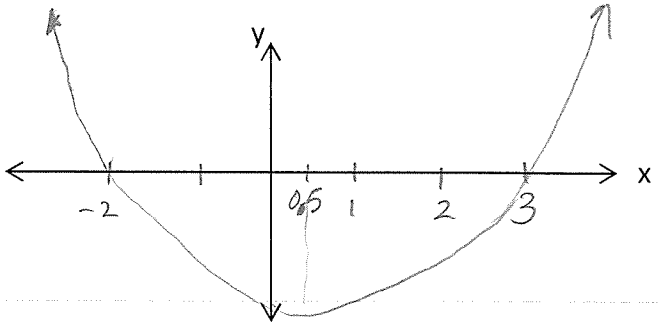
c) $(-1, \infty)$ d) $(-\infty, -1)$

VI. Sketch a graph of the polynomial function f having the given characteristics. Then describe the degree and leading coefficient of the function f.

37.
- f is increasing when $x > 0.5$; f is decreasing when $x < 0.5$.
- $f(x) > 0$ when $x < -2$ and $x > 3$; $f(x) < 0$ when $-2 < x < 3$.

Degree even

LC +

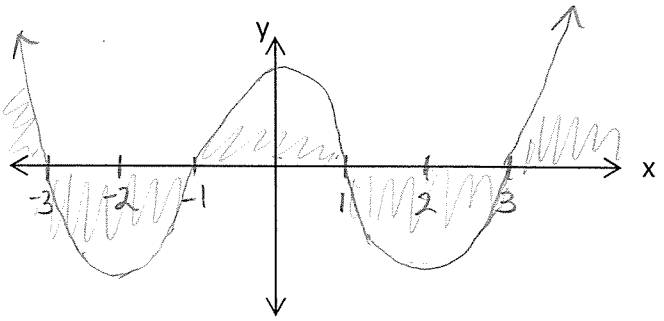


39.
- f is increasing when $-2 < x < 0$ and $x > 2$; f is decreasing when $x < -2$ and $0 < x < 2$.
- $f(x) > 0$ when $x < -3$, $-1 < x < 1$, and $x > 3$; $f(x) < 0$ when $-3 < x < -1$ and $1 < x < 3$.

Step 1 shade in slightly

Degree even

LC +



VII. Find the difference. Do some horizontally and some vertically.

9. $(3x^3 - 2x^2 + 4x - 8) - (5x^3 + 12x^2 - 3x - 4)$

$+ -5x^3 - 12x^2 + 3x + 4$

$-2x^3 - 14x^2 + 7x - 4$

10. $(7x^4 - 9x^3 - 4x^2 + 5x + 6) - (2x^4 + 3x^3 - x^2 + x - 4)$

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

$5x^4 - 12x^3 - 3x^2 + 4x + 10$

11. $(5x^6 - 2x^4 + 9x^3 + 2x - 4) - (7x^5 - 8x^4 + 2x - 11)$

$5x^6 - 2x^4 + 9x^3 + 2x - 4 - 7x^5 + 8x^4 - 2x + 11$

$5x^6 - 7x^5 + 6x^4 + 9x^3 + 7$

12. $(4x^5 - 7x^3 - 9x^2 + 18) - (14x^5 - 8x^4 + 11x^2 + x)$

$4x^5 - 7x^3 - 9x^2 + 18 - 14x^5 + 8x^4 - 11x^2 - x$

$-10x^5 + 8x^4 - 7x^3 - 20x^2 - x + 18$