Name Key Date ____________ Pd ______

4.1 – 4.4 Polynomial Practice WS (Daily and Quiz Review)

I. 4.1 Graphing Polynomial Functions

State the degree, odd/even, leading coefficient, positive/negative, and state the number of terms. Then name each polynomial function.

	1) $-10x$	2) $-10r^4 - 8r^2$	3) 7	4) $9a^6 + 3a^5 - 4a^4 - 3a^2 + 9$
Degree	one	four	zero	six
Odd/Even	odd	even	neutral	even
Leading Coefficient	-10	-10	7	9
Positive/Negative	neg.	neg.	pos.	positive
# of Terms	one	two	one	five
Name	Linear monomial	quartic binomial	constant monomial	6th degree polynomial

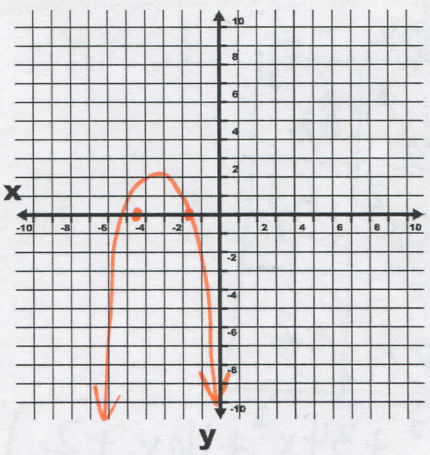
Describe the end behavior of each function.

	5) $f(x) = x^3 - 4x^2 + 7$	6) $g(x) = -x^2 + 4x$	7) $h(x) = x^5 - 4x^3 + 5x + 2$
Degree	three	two	five
Odd/Even	odd	even	odd
LC	1	-1	1
Positive/Negative	positive	neg.	positive
End Behavior	As $x \to +\infty$, $f(x) \to +\infty$; As $x \to -\infty$, $f(x) \to -\infty$	As $x \to \pm\infty$, $g(x) \to -\infty$	As $x \to +\infty$, $h(x) \to +\infty$; As $x \to -\infty$, $h(x) \to -\infty$

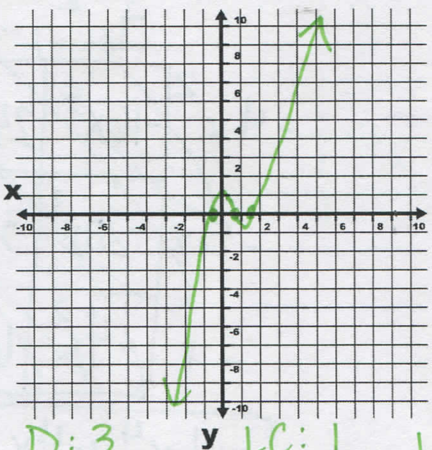
Sketch the general shape of each function. (HINT: use the steps from your notes)
not exact

8) $f(x) = -x^2 - 6x - 7$

D = 2
LC: -1
even
neg

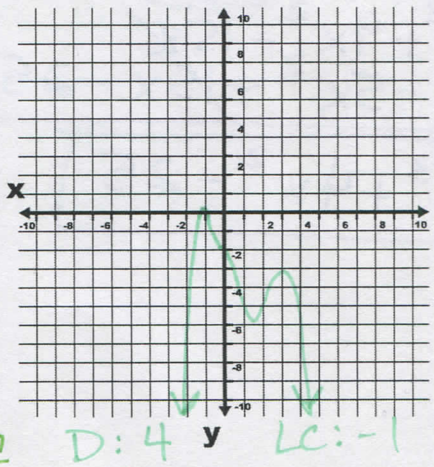


9) $g(x) = x^3 - 2x^2 + 1$



D: 3
odd
LC: 1
pos.

10) $h(x) = -x^4 + 3x^3 - 2 - 5x$



D: 4
even
LC: -1
neg

Evaluate each function at the given value. (HINT: show all work for full credit) Synthetic Substitution

11) $f(x) = -x^3 + 6x - 7$ at $x = 2$

$f(2) = -(2)^3 + 6(2) - 7 =$

$= -8 + 12 - 7 = -3$

$\boxed{f(2) = -3}$

12) $g(x) = x^3 + x^2 - 5x - 6$ at $x = 2$

$g(2) = (2)^3 + (2)^2 - 5(2) - 6$

$= 8 + 4 - 10 - 6 = -4$

$\boxed{g(2) = -4}$

II. 4.2 Adding, Subtracting, & Multiplying Polynomials

Simplify each expression.

13) $(4m^4 - m^2) + (5m^2 + m^4)$

$4m^4 - m^2 + 5m^2 + m^4$

$\boxed{5m^4 + 4m^2}$

OR $\boxed{m^2(5m^2 + 4)}$

14) $(5x + x^4) - (3x^4 + 4x)$

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

$\boxed{-2x^4 + x}$

OR $\boxed{-x(2x^3 - 1)}$

15) $(13m^4 + 2) + (m^4n^2 + 2 - 2m^4) - (-13m^2n^3 + 5m^4)$

$\cancel{13m^4} + 2 + m^4n^2 + 2 - \cancel{2m^4} + 13m^2n^3 - \cancel{5m^4}$

$\boxed{6m^4 + m^4n^2 + 13n^2n^3 + 4}$

16) $(5v - 1)(4v + 3)$ FOIL

$20v^2 + 15v - 4v - 3$

$\boxed{20v^2 + 11v - 3}$

17) $(3x + 5)(-x^2 + 3x - 5)$

$-3x^3 + 9x^2 - \cancel{15x}$

$+ \quad -5x^2 + \cancel{15x} - 25$

$\boxed{-3x^3 + 4x^2 - 25}$

18) $(-4x^2 - 5x - 1)(4x^2 - 6x - 2)$

	$4x^2$	$-6x$	-2
$-4x^2$	$-16x^4$	$24x^3$	$8x^2$
$-5x$	$-20x^3$	$30x^2$	$10x$
-1	$-4x^2$	$6x$	$+2$

$\boxed{-16x^4 + 4x^3 + 34x^2 + 16x + 2}$

III. 4.3 Dividing Polynomials

Remainder Thm & Factor Thm

State if the given binomial is a factor of the given polynomial using Synthetic Substitution.

19) $(k^3 - k^2 - k - 2) \div (k - 2)$

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

$= 8 - 4 - 2 - 2 = \boxed{0}$ ✓

no remainder

Yes binomial is a factor

20) $(b^4 - 8b^3 - b^2 + 62b - 34) \div (b - 7)$

$f(7) = (7)^4 - 8(7)^3 - (7)^2 + 62(7) - 34$

$\boxed{f(7) = 8}$

Not a factor

Divide each polynomial. Be sure to use both long division and synthetic division. Use both methods twice.

21 & 22 LONG 23 & 24 synthetic

21) $(p^5 + 8p^4 + 2p^2 + 19p + 16) \div (p + 8)$

$p^4 + 2p + 3$

$p+8 \overline{) p^5 + 8p^4 + 0p^3 + 2p^2 + 19p + 16}$

$-\ \cancel{p^5} + \cancel{8p^4}$

$2p^2 + 19p$

$-\ \cancel{2p^2} + 16p$

$3p + 16$

$-\ \cancel{3p} + 24$

-8

$\boxed{p^4 + 2p + 3 \text{ R. } -8}$

22) $(x^4 - 2x^3 - 16x^2 + 28x + 9) \div (x - 4)$

$x^3 + 2x^2 - 16x - 36$

$x-4 \overline{) x^4 - 2x^3 - 16x^2 + 28x + 9}$

$-\ \cancel{x^4} - 4x^3$

$2x^3 - 16x^2$

$-\ \cancel{2x^3} - 8x^2$

$-16x^2 + 28x$

$-\ {-\cancel{16x^2}} + 64x$

$-36x + 9$

$-\ \cancel{36x} + 144$

-135

$\boxed{x^3 + 2x^2 - 16x - 36 \text{ R. } -135}$

23) $(r^5 + 6r^4 - 13r^3 - 5r^2 - 8r + 14) \div (r - 2)$

2	1	6	-13	-5	-8	14
+	↓	2	16	6	2	-12
	1	8	3	1	-6	2

$\boxed{r^4 + 8r^3 + 3r^2 + r - 6 \text{ R. } 2}$

24) $(8v^5 + 32v^4 + 5v + 20) \div (v + 4)$

-4	8	32	0	0	5	20
+	↓	-32	0	0	0	-20
	8	0	0	0	5	0

$\boxed{8x^4 + 5}$

IV. 4.4 Factoring Polynomials

25. $(x^3 - 5x^2)(-x + 5)$

$x^2(x-5) - 1(x-5)$

$(x^2-1)(x-5)$

$\boxed{(x+1)(x-1)(x-5)}$

26. $x^4 - 2x^2 - 15$

$\boxed{(x^2-5)(x^2+3)}$

-15

-5 +3

-2

27. $(x^6 + 2x^4)(-16x^2 - 32)$

$x^4(x^2+2) - 16(x^2+2)$

$(x^4-16)(x^2+2)$

$(x^2+4)(x^2-4)(x^2+2)$

$\boxed{(x^2+4)(x+2)(x-2)(x^2+2)}$

SOAP x2

28. $x^6 - 26x^3 - 27$

$(x^3-27)(x^3+1)$

$a=x \quad b=3 \qquad a=x \quad b=1$

$\boxed{(x-3)(x^2+3x+9)(x+1)(x^2-x+1)}$

-27

-27 +1

-26

29. $x^6 - 4x^2$

$x^2(x^4-4)$ Diff. of squares

$a=x^2 \quad b=2$

$\boxed{x^2(x^2+2)(x^2-2)}$

30. $(4x^3 - x^2)(-4x + 1)$

$x^2(4x-1) - 1(4x-1)$

$(x^2-1)(4x-1)$

$\boxed{(x+1)(x-1)(4x-1)}$

Diff of Squares