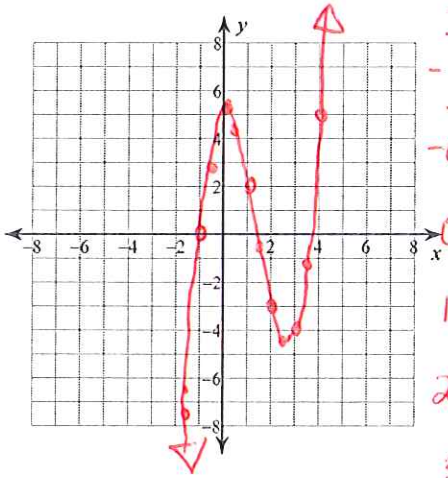
Algebra 2 Name _____

Chapter 5 Review

Date _____ Period ____

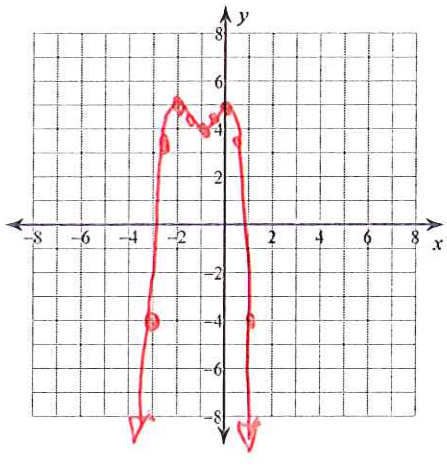
Sketch the graph of each function. * always go up by ½'s. Make table.

1) $f(x) = x^3 - 4x^2 + 5$



x	y
-2	-19
-1.5	-7.4
-1	0
-0.5	3.9
0	5
0.5	4.1
1	2
1.5	-0.6
2	-3
2.5	-4.4
3	-4
3.5	-1.1
4	5

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



x	y
-3	-4
-2.5	3.4
-2	5
-1.5	4.4
-1	4
-0.5	4.4
0	5
0.5	3.4
1	-4
1.5	-22.6

3) Answer the following questions about problem number 1

a) Maximum number of turns? 2 (always 1 less than highest degree)

b) End Behavior? Falls to the left, rises to the right

c) Relative Min? (2.5, -4.4) look at table

d) Relative Max? (0, 5)

e) Increasing? $(-\infty, 0) \cup (2.5, \infty)$ } x-values only

f) Decreasing? (0, 2.5) } x-values only

g) Zeros at...? -1, 1.4, 3.6 used calculator in table →

h) Degree of the polynomial? 3 highest exponent

i) Range? $(-\infty, \infty)$

4) Answer the following questions about problem number 2

a) Maximum number of turns? 3

b) End Behavior? falls to left, falls to right

c) Relative Min? (-1, 4)

d) Relative Max? (-2, 5) and (0, 5)

e) Increasing? $(-\infty, -2) \cup (-1, 0)$

f) Decreasing? $(-2, -1) \cup (0, \infty)$

g) Zeros at...? -2.8, 0.8 used "calculate" "zero" on graphing calculator. video online

h) Degree of the polynomial? 4

i) Range? $(-\infty, 5]$ ← y-values

Name each polynomial by degree and number of terms. (i.e. cubic binomial)

5) $7x^3 - 5x^2$ cubic binomial

6) $-r^2$ quadratic monomial

7) $-10x - 9$ linear binomial

8) $-10k^4 - 7 + 6k^3$ quartic trinomial

Divide using long division.

9) $(n^3 - 6n^2 + 12n - 18) \div (n - 3)$

$n^2 - 3n + 3$ R -9

$n-3 \overline{)\, n^3 - 6n^2 + 12n - 18}$

$-n^3 + 3n^2$ ↓

$-3n^2 + 12n$

$+3n^2 - 9n$

$3n - 18$

$-3n + 9$

-9

* Remember you are subtracting so switch your signs!

Divide using synthetic division.

10) $(x^4 - x^3 + 2x - 2) \div (x - 1)$

$x - 1 = 0$

$x = 1$

1	1	−1	0	2	−2
		1	0	0	2
	$1x^3$	$0x^2$	$0x$	2	0

* Fill in missing exponents with zeros!

$x^3 + 2$

x^3 x^2 x constant last # is remainder

* Solve

11) $(p^5 - 9p^3 - 33p^2 + 18p + 13) \div (p - 4)$

4	1	0	−9	−33	18	13
		4	16	28	−20	−8
	$1x^4$	$4x^3$	$7x^2$	$-5x$	−2	5

$x^4 + 4x^3 + 7x^2 - 5x - 2$ R5

Factor each.

12) $x^4 + 5x^2 + 6 = 0$

What mult. to 6 & adds to 5?

$(x^2 + 2)(x^2 + 3)$

$x^2 + 2 = 0$ $x^2 + 3 = 0$

$x^2 = -2$ $x^2 = -3$

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

13) $x^3 - 3x^2 - 10x = 0$

GCF first!

$x(x^2 - 3x - 10) = 0$

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

$x = 0$ $x - 5 = 0$ $x + 2 = 0$

$x = 0, 5, -2$

14) $x^3 - 5x^2 - 4x + 20 = 0$

* Grouping

$x^2(x - 5) - 4(x - 5)$

$(x^2 - 4)(x - 5)$

Difference of squares.

$(x + 2)(x - 2)(x - 5)$

$x = 2, -2, 5$

15) $81x^4 - 1 = 0$

$(9x^2 - 1)(9x^2 + 1) = 0$ Difference of Squares twice!

$(3x - 1)(3x + 1)(9x^2 + 1) = 0$ Must be subtraction

$3x - 1 = 0$ $3x + 1 = 0$ $9x^2 - 1 = 0$

$x = 1/3, -1/3$

$\sqrt{x^2} = \sqrt{1/9}$

$x = 1/3$

Find all zeros. Then state the multiplicity of each zero and whether the function will bounce or pass through at that point.

16) $y = (x^2 - 7)^4 (x + 12)^5 (x - 2)$

$x^2 - 7 = 0$ $x + 12 = 0$ $x - 2 = 0$

$x^2 = 7$

$x = \pm\sqrt{7}$ | Mult. 4 | bounce

$x = -12$ | Mult 5 | pass

$x = 2$ | Mult 1 | pass

* Multiplicity is how many times its repeated.

- even multiplicity → bounce
- odd multiplicity → pass through.

Find all zeros using any method (Calc., factoring, quad. form, p/q)

17) $f(x) = x^3 + 8$ * sum of cubes formula

$X^3 + 2^3$

$(x+2)(x^2-2x+4) = 0$

↑ solve ↑ Quad form.

$X+2=0$

$X=-2$

$X = \frac{2 \pm \sqrt{4-4(1)(4)}}{2}$

$X = \frac{2 \pm \sqrt{-12}}{2} = \frac{\sqrt{-4}}{\sqrt{3}}$

$X = \frac{2 \pm 2i\sqrt{3}}{2}$

$X = 1 \pm i\sqrt{3}$

Degree 3 Means 3 answers

18) $f(x) = (2x^4 + 5x^3) + (4x^2 + x)$

$x^3(2x+5)$

Crap... factoring doesn't work. :(

Looks like zero might work on the picture

0	2	5	4	1	0
		0	0	0	0
	$2x^3$	$5x^2$	$4x$	1	0

← :) remainder of zero means it's a zero!

Now use answer. Looks like -1 might work

-1	2	5	4	1
		-2	-3	-1
	$2x^2$	$3x$	1	0

← :)

Now its quadratic so use quad formula

$2x^2+3x+1=0$ $\frac{-3 \pm \sqrt{9-4(2)(1)}}{2(2)}$ $\frac{-3 \pm \sqrt{1}}{4}$ $\frac{-3+1}{4}$ $\frac{-3-1}{4}$

$\frac{-2}{4}$ $\frac{-4}{4}$

$-\frac{1}{2}$ -1

$X = 0, -1, -\frac{1}{2}$

-1 repeats ↳ w/ multiplicity of 2

19) $f(x) = 2x^3 - 7x^2 + 6x + 5$

Not factorable. Look at graph. calc. Looks like $-\frac{1}{2}$ is a zero. Try it.

$-\frac{1}{2}$	2	-7	6	5
		-1	4	-5
	$2x^2$	$-8x$	10	0

yay! it works!

Now use quad formula ← take out a 2 first

$2x^2-8x+10=0$

$x^2-4x+5=0$

$X = \frac{4 \pm \sqrt{16-4(1)(5)}}{2}$

$X = \frac{4 \pm \sqrt{-4}}{2}$

$X = \frac{4 \pm 2i}{2}$

$X = 2 \pm i$

$X = -\frac{1}{2}$

x	y
-2.5	-4.5
-2	0
-1.5	1
-1	0
-0.5	-1.5
-.5	-1.5
0	-2
0.5	0

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

Hey, I can see all 3 on my graphing calculator table!

$X = -2, -1, \frac{1}{2}$

Simplify.

21) $\sqrt[3]{375}$

$\sqrt[3]{125} \cdot \sqrt[3]{3}$

$5\sqrt[3]{3}$

22) $\sqrt[3]{256}$

$\sqrt[3]{64} \cdot \sqrt[3]{4}$

$4\sqrt[3]{4}$

23) $\sqrt[4]{486}$

$\sqrt[4]{81} \cdot \sqrt[4]{6}$

$3\sqrt[4]{6}$

Solve the following radical equations

24) $2(x-6)^3 + 1 = 17$

$-1 \quad -1$

$\frac{2(x-6)^3}{2} = \frac{16}{2}$

$\sqrt[3]{(x-6)^3} = \sqrt[3]{8}$ ← NO ± for cubed roots

$x-6=2$

$x=8$

25) $(x-4)^4 - 5 = 1870$

$(x-4)^4 = 1875$ ← don't forget ±

$(x-4) = \pm\sqrt[4]{1875}$

$x-4 = \pm\sqrt[4]{625} \cdot \sqrt[4]{3}$ Not like terms so cannot combine

$x-4 = \pm 5\sqrt[4]{3}$

$x = 4 \pm 5\sqrt[4]{3}$

Expand completely.

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1

26) $(4y-1)^4$

$1(4y)^4 + 4(4y)^3(-1) + 6(4y)^2(-1)^2 + 4(4y)(-1)^3 + 1(-1)^4$

$256y^4 - 256y^3 + 96y^2 - 16y + 1$

27) $(2x^2-3)^3$

$1(2x^2)^3 + 3(2x^2)^2(-3) + 3(2x^2)(-3)^2 + 1(-3)^3$

$8x^6 - 36x^4 + 54x^2 - 27$

28) Write a cubic function that is shifted left 2 and down 7

x^3; $+2$ inside; -7 outside

$y = (x+2)^3 - 7$

29) Write a quartic function that is stretched by a factor of 2, is shifted up 3 and has a relative maximum.

x^4; mult by 2; $+3$ outside; Must open down so need $-$ out front

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

Write a polynomial function of least degree with integral coefficients that has the given zeros.

30) 4, $\sqrt{3}$, $-\sqrt{3}$

free b/c $\sqrt{}$ come in pairs

$(x-4)(x-\sqrt{3})(x+\sqrt{3})$

$x^2 + \sqrt{3}x - x\sqrt{3} - \sqrt{9}$

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

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

$f(x) = x^3 - 4x^2 - 3x + 12$

31) 4, $3i$, $-3i$

free b/c i's come in pairs. $i^2 = -1$

$(x-4)(x-3i)(x+3i)$

$(x-4)(x^2+3ix-3ix-9i^2)$

$(x-4)(x^2+9)$

$x^3 + 9x - 4x^2 - 36$

$f(x) = x^3 - 4x^2 + 9x - 36$

Evaluate each function at the given value.

32) $f(n) = n^3 - 9n^2 + 21n - 20$ at $n = 3$

3	1	−9	21	−20
		3	−18	9
	1	−6	3	−11

Remainder is the answer.

$f(3) = -11$