Honors Algebra 2
Chapter 3 Review

Name: KEY
Block: _____

NON-CALCULATOR

3-1 In 1-2, determine if the following is a polynomial or not. If it is, put it in standard form and give the degree. If it is not, explain why not.

1) $-5x^2-7x^5+8+3x^4$

IS a polynomial degree = 5

$-7x^5+3x^4-5x^2+8$

2) $15x+4\sqrt{x^3}-x^5$ → this is $x^{3/2}$

NOT a polynomial

3:1-2 In 3-5, perform the indicated operation.

3) $(3x^3+2x^2-4x+1)+(-6x^3+11x+6)$ ← ADD!

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

4) $(8-6x^2+x^3-x+7x^4)-(3-5x^3+2x+4x^4)$ ↓ SUBTRACT!

$8-6x^2+x^3-x+7x^4$
$-3\qquad +5x^3-2x-4x^4$
$5-6x^2+6x^3-3x+3x^4$

$3x^4+6x^3-6x^2-3x+5$

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

$-20x^5+12x^4-28x^3$
$+10x^3-6x^2+14x$
$-45x^2+27x-63$

$-20x^5+12x^4-18x^3-51x^2+41x-63$

3-3 6) Divide using long division: $\dfrac{9x^3-4x+5}{3x-1}$

$3x^2+x-1+\dfrac{4}{3x-1}$

$3x-1\ \overline{)\ 9x^3+0x^2-4x+5}$

$3x^2+x-1$

$-(9x^3-3x^2)$ ↓
$3x^2-4x$
$-(3x^2-x)$ ↓
$-3x+5$
$-(-3x+1)$
4

3-3 Use synthetic substitution to evaluate the given polynomial for $x=-2$

7) $6x^4-3x^3-12x^2-5x+6$

−2	6	−3	−12	−5	6
		−12	30	−36	82
	6	−15	18	−41	(88)

88

8) $x^4-3x^3-11x^2-9$

−2	1	−3	−11	0	−9
		−2	10	2	−4
	1	−5	−1	2	−13

−13

3-4 9) Factor each expression

a) $27x^6+125$ Sum of CUBES $a=3x^2$ $b=5$

$(3x^2+5)(9x^4-15x^2+25)$

b) $y^3+7y^2+2y+14$ GROUPING

	y	7
y^2	y^3	$7y^2$
2	$2y$	14

$(y+7)(y^2+2)$

c) $6x^4-23x^2+20$ TREAT LIKE x^2 & x

	$2x^2$	−5
$3x^2$	$6x^4$	$-15x^2$
−4	$-8x^2$	20

$(2x^2-5)(3x^2-4)$

120	−23
1 120	
2 60	
3 40	
4 30	
5 24	
6 20	
−8 −15	

3-5 10) Determine all the solutions of $f(x) = 4x^3 + 12x^2 - x - 3$ by factoring.

$4x^3 + 12x^2 - x - 3 = 0$

$(x+3)(4x^2 - 1) = 0$

$(x+3)(2x+1)(2x-1) = 0$

$x+3=0 \quad 2x+1=0 \quad 2x-1=0$

$x = -3 \quad x = -1/2 \quad x = 1/2$

GROUPING

	x	3
$4x^2$	$4x^3$	$12x^2$
-1	-x	-3

3:4-6 Find all real and imaginary zeros of each function.

11) $f(x) = (2x-3)(4-x)(x+7) = 0$

$2x-3=0 \quad 4-x=0 \quad x+7=0$

$x = 3/2 \quad 4 = x \quad x = -7$

12) $f(x) = 2x^3 + x^2 - 13x + 6$; given -3 is a zero

-3	2	1	-13	6
		-6	15	-6
	2	-5	2	0

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

$(2x-1)(x-2) = 0$

$2x-1=0 \quad x-2=0$

$x = 1/2 \quad x = 2$

Zeros
$x = -3$
$x = 1/2$
$x = 2$

13) $f(x) = 5x^4 + 3x^3 + 3x^2 + 3x - 2$; given -1 and $\frac{2}{5}$ are zeros.

-1	5	3	3	3	-2
		-5	2	-5	2
2/5	5	-2	5	-2	0
		2	0	2	
	5	0	5	0	

$5x^2 + 5 = 0$

$5x^2 = -5$

$x^2 = -1$

$x = \pm\sqrt{-1}$

$x = \pm i$

Zeros
$x = -1$
$x = 2/5$
$x = i$
$x = -i$

3-6 14). Write the simplest polynomial function in factored form with the given zeros.

a) zeros of $\frac{-6}{5}$ and 2 (multiplicity of 2)

$y = (x + \frac{6}{5})(x-2)^2$

OR

$y = (5x+6)(x-2)^2$

b) zeros of 3 and $\sqrt{2}$ ($-\sqrt{2}$ ALSO!)

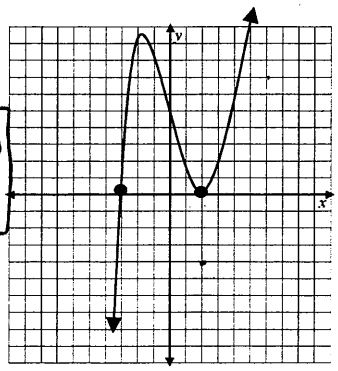
$y = (x-3)(x-\sqrt{2})(x+\sqrt{2})$

c) zeros of 5 and $-3i$ ($+3i$ ALSO!)

$y = (x-5)(x+3i)(x-3i)$

3-7 For the graphs below, identify whether the function has an even or odd degree and positive or negative leading coefficient. Also, identify the zeros and their multiplicity.

15)

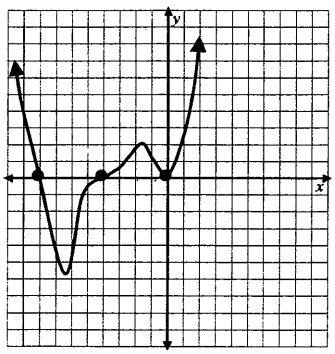


Zeros
$x = 2$ (mult = 2)
$x = -3$ (mult = 1)

Degree is ODD
(ble end behavior is different)

Positive Leading Coefficient

16)



- Even Degree
- Positive Leading Coefficient

Zeros
$x = -8$ mult = 1
$x = -4$ mult = 3
$x = 0$ mult = 2

3:6-7 17) Can a 5th degree polynomial...

a) have 4 turning points? Explain.

YES

b) have 6 zeros? Explain.

No... a 5th degree polynomial will have 5 zeros (including multiplicities)

c) have exactly 2 real zeros of multiplicity 1? Explain.

No, b/c then you would have to have 3 complex zeros b/c complex zeros must come in pairs

3-7 For questions 18-19, find each of the following for the given function:

a) List the degree.

b) Describe the end behavior using infinity notation.

c) Find the zeros (including their multiplicity).

d) Based on the information from parts (a) through (c), sketch a graph of the function. Your sketch should have a scale on the x-axis only.

18) $f(x) = -2x(x+3)(x-4)^2$ $= -2x^4 + \cdots$

a) Degree = 4

b) as $x \to \infty$, $f(x) \to -\infty$

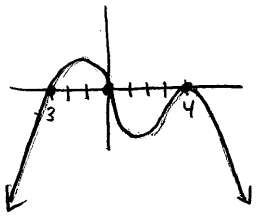
as $x \to -\infty$, $f(x) \to -\infty$

c) Zeros

$x = 0$ mult = 1

$x = -3$ mult = 1

$x = 4$ mult = 2



19) $f(x) = x^3 + 3x^2 - 9x - 27$

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

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

	x	3
x^2	x^3	$3x^2$
-9	$-9x$	-27

a) degree = 3

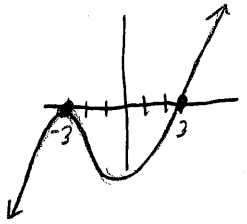
b) as $x \to \infty$, $f(x) \to \infty$

as $x \to -\infty$, $f(x) \to -\infty$

c) Zeros

$x = 3$ mult = 1

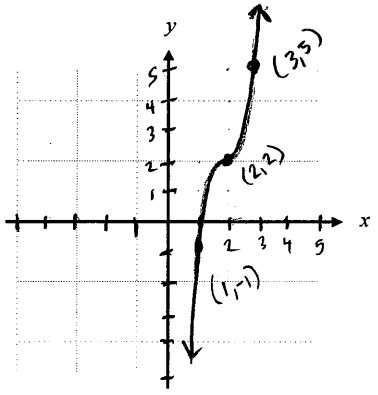
$x = -3$ mult = 2



3-8 20) Consider the parent function $f(x) = x^3$. Rewrite given the following transformations and then sketch the transformed graph:

Vertical Stretch by a factor of 3 followed by a horizontal translation 2 units right and a vertical translation 2 units up.

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

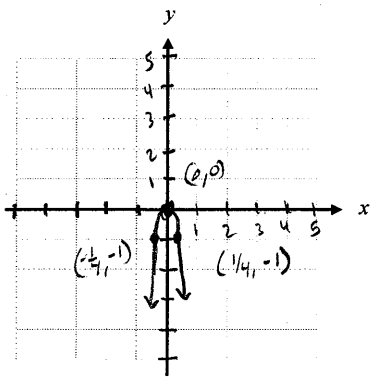


3-8 21) Consider the parent function $f(x) = x^4$. Rewrite given the following transformations and then sketch the transformed graph:

Reflection across the x-axis followed by a horizontal compression by a factor of $\frac{1}{4}$.

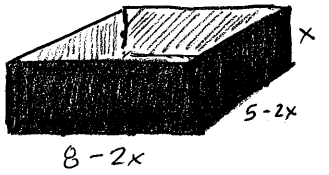
$+y$ → opposite y's $(-y)$

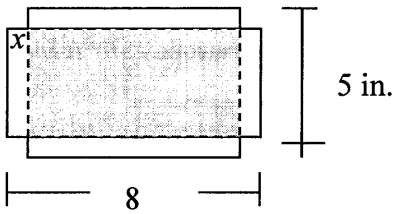
$y = -(4x)^4$



CALCULATOR ALLOWED

3-2 22) You are making an open box to hold paper clips out of a piece of cardboard that is 5 inches by 8 inches. The box will be formed by making an x inch by x inch square cut out of the corners as shown in the diagram and folding up the sides. **You want the box to have the greatest volume possible.**





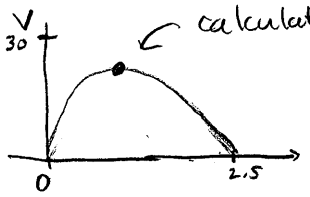
a) Write an equation for the Volume of the box as a function of the length of the cut, x.

$V = x(8-2x)(5-2x)$

b) Use a graphing calculator to find how long you should make the cuts. Explain your reasoning.

Domain: $0 < x < 2.5$

make the cuts 1 in.



c) What is the maximum volume of the box?

max volume = 18 in^3

d) What will the dimensions of the finished box be?

height = $x = 1$

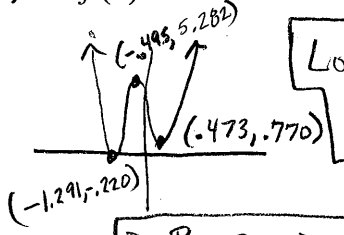
width = $8-2x = 6$

length = $5-2x = 3$

$3 \times 6 \times 1$

3-7 Graph the polynomial to find all local minimum(s) and maximum(s). Then give the domain and range.

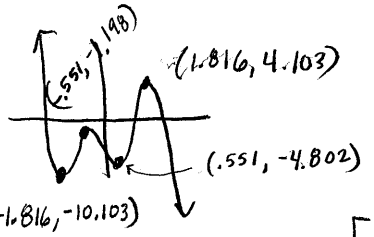
23) $f(x) = 2x^6 + 10x^3 - 7x + 3$



Local max = 5.282
Local min = .770 & -.220

D: ℝ R: $y \geq -.220$

24) $f(x) = -x^5 + 6x^3 - 5x - 3$



Local max
-1.198
4.103

D: ℝ
R: ℝ

Local min
-10.103
-4.802

3-9 25) Find and **verify** all zeros of the function. SHOW ALL WORK!!!

$y = 2x^3 + 3x^2 - 3x + 5$

List all possible zeros: $\pm 1, \pm 5, \pm \frac{1}{2}, \pm \frac{5}{2}$

$\pm \frac{\text{factors of } 5}{\text{factors of } 2} = \frac{1,5}{1,2}$

graph $y = 2x^3 + 3x^2 - 3x + 5$

$x = -5/2$ looks like a zero

$-5/2 \mid 2 \quad 3 \quad -3 \quad 5$

$\quad\quad\quad -5 \quad 5 \quad -5$

$\quad 2 \quad -2 \quad 2 \quad 0$

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

$2(x^2 - x + 1) = 0$

$x^2 - x + 1 = 0$

$x = \frac{1 \pm \sqrt{1 - 4(1)(1)}}{2(1)} = \frac{1 \pm \sqrt{-3}}{2} = \frac{1 \pm i\sqrt{3}}{2}$

Zeros
$x = -5/2$
$x = \frac{1 + i\sqrt{3}}{2}$
$x = \frac{1 - i\sqrt{3}}{2}$

3-9 26) The table shows the number of sandwiches sold each day at ta deli over 5 days.

Day	0	1	2	3	4	5
Sandwiches	196	57	72	101	89	66

139 -15 -29 12 23

154 14 -41 -11

140 55 -30

85 85

a) Determine the degree of the polynomial that would fit the data. Explain how you know.

Since the 4th Differences are the same, the polynomial would be QUARTIC (degree = 4)

b) Write a polynomial function for the data.

$y = 3.541666667x^4 - 44.58333333x^3 + 185.9583333x^2 - 283.9166667x + 196$

STORE AS Y_1

c) Use your function from part b to determine the number of sandwiches expected to be sold on day 6.

6. $x = 6$

$y_1(6) = \boxed{147}$

REMEMBER: Any questions from the previous chapter reviews are fair game for this test!!!