Precalculus
Q1 Cumulative Review – Chapter1 and 2
***Denotes "No Calc" problems*

Name: Key

CHAPTER 1

1. KNOW THE **11 BASIC FUNCTIONS** and their key features such as: even, odd, neither; boundedness; extrema; intervals of increasing, decreasing, constant; domain and range; intercepts; etc.

(#2-8) Use the equation $f(x)=x^4-3x^3+x-1$ to find its properties listed below.

2. Absolute maximum: n/a

3. Absolute minimum: $y=-7.32$ @ $x=2.20$

4. Local maximum(s): $y=-.76$ @ $x=.36$

5. Local minimum(s): $y=-7.32$ @ $x=2.20$
   $y=-1.21$ @ $x=0.31$

6. Increasing intervals: $[.31,.36]\cup[2.20,\infty)$

7. Decreasing intervals: $(-\infty,.31]\cup[.36,2.20]$

8. Constant intervals: n/a

9. Even/odd/neither? neither

(#10-12) Find the domain of the following functions. **

10. $f(x)=x+\sqrt{x-4}$

$x-4\geq 0$
$x\geq 4$
$\boxed{[4,\infty)}$

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

$\mathbb{R}$

12. $f(x)=\dfrac{1}{x\sqrt{4-x^2}}$

$x\neq 0$ $\quad 4-x^2>0$
$(2+x)(2-x)>0$

$-3 \quad -1 \quad 1 \quad 3$
$\ominus \quad -2 \quad \oplus \quad 0 \quad \oplus \quad 2 \quad \ominus$

$\boxed{(-2,0)\cup(0,2)}$

(#13-15) Use the equation $f(x)=-3x^2-2$. **

13. Is the function bounded/bounded above/bounded below/neither? *Circle one.*

14. Is the function even/odd/neither? *Circle one.*

15. Describe the transformations taking place (in order). $\boxed{y=x^2}$

vert.
① reflect over x-axis
② stretch bafo 3
③ ↓ 2

OR ② → ① → ③

(#16-19) Use the functions to evaluate the following: $f(x)=\sqrt{x^2-9}$, $g(x)=2x+3$ **

16. $f+g = \sqrt{x^2-9} + 2x+3$

17. $f-g \quad \sqrt{x^2-9} - 2x - 3$

18. $f(g(x)) = \sqrt{(2x+3)^2-9}$

$= \sqrt{4x^2+12x+9-9}$

$= \boxed{\sqrt{4x^2+12x}}$

19. $g(f(x)) = \boxed{2(\sqrt{x^2-9})+3}$

20. Confirm the following two functions are inverses of one another: $f(x)=\frac{1}{2}x^3+4$, $g(x)=\sqrt[3]{2x-8}$ **

$f(g(x)) = \frac{1}{2}(\sqrt[3]{2x-8})^3+4 = \frac{1}{2}(2x-8)+4 = x-4+4 = x$ ✓

$g(f(x)) = \sqrt[3]{2(\frac{1}{2}x^3+4)-8} = \sqrt[3]{x^3+8-8} = \sqrt[3]{x^3} = x$ ✓

21. Find the inverse of $f(x)=\sqrt{x-1}+4$ and state the domain of $f^{-1}(x)$.**

range: $[4,\infty)$

$x = \sqrt{y-1}+4$

$x-4 = \sqrt{y-1}$

$x^2-8x+16+1 = y$

$\boxed{f^{-1}(x) = x^2-8x+17 \quad d: [4,\infty)}$

(#22-23) Use the function $h(x)=-3|x-2|+7$

22. List the parent functions and the transformations (in order) taking place. **

Vertical

① flip over x-axis

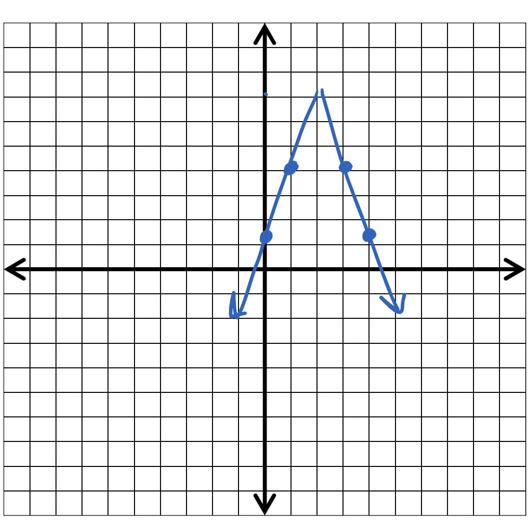
② stretch bafo 3

③ ↑7

Horizontal

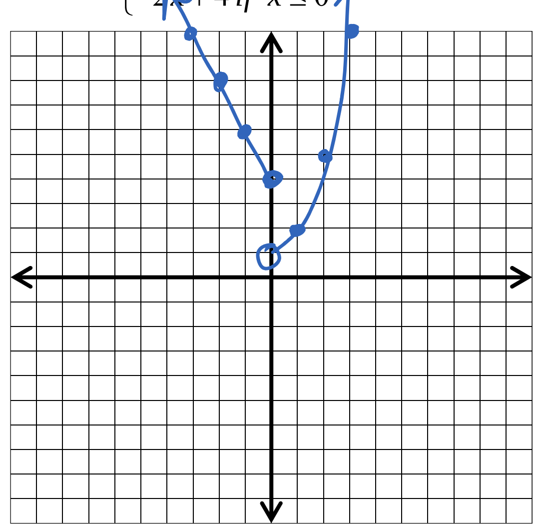
① →2

23. Graph $h(x)$. Plot at least 4 accurate points. **



24. Graph the following piecewise function:

$$f(x)=\begin{cases} x^2+1 \; if \; x>0 \\ -2x+4 \; if \; x\le 0 \end{cases}$$ **



CHAPTER 2

25. Find the vertex and axis of symmetry: $y = 3x^2 + 12x - 1$**

$x = \frac{-12}{2(3)} = \boxed{\begin{array}{l} x = -2 \\ \text{Vertex}: (-2, -13) \end{array}}$

$3(-2)^2 + 12(-2) - 1$

$3(4) - 24 - 1$

26. Convert #25 to vertex form by completing the square.**

$y = 3(x^2 + 4x + \underline{4}) - 1 - \underline{12}$

$\boxed{y = 3(x+2)^2 - 13}$

27. Write an equation of the line passing through (-2 , 7) and (2 , -1).**

$m = \frac{-1-7}{2+2} = \frac{-8}{4} = -2$

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

OR

$y + 1 = -2(x-2)$

OR

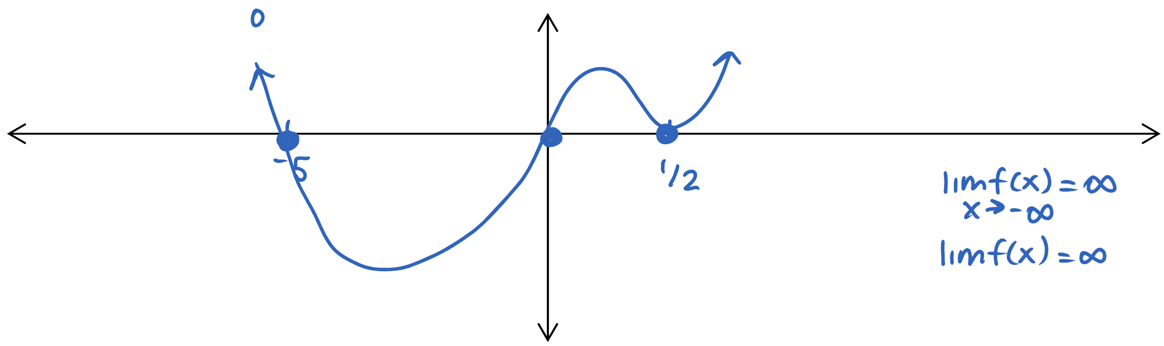
$y = -2x + 3$

28. Sketch a graph of the following polynomial: $f(x) = x(2x-1)^2(x+5)^3$. Include zeros (with multiplicity), end behavior and the y-intercept **

$0(1)$ $1/2(2)$ $-5(3)$

LT: $4x^6$

0



$\lim\limits_{x \to -\infty} f(x) = \infty$

$\lim\limits_{x \to -\infty} f(x) = \infty$

29. Factor completely. Then write a linear factorization of the function (factored form):

$g(x) = x^5 - 3x^4 - 5x^3 + 5x^2 - 6x + 8 \Rightarrow \boxed{g(x) = (x+2)(x-1)(x-4)(x+i)(x-i)}$

zeros from calc: -2, 1, 4

-2	1	-3	-5	5	-6	8
	↓	-2	10	-10	10	-8
	1	-5	5	-5	4	0

1	1	-5	5	-5	4
	↓	1	-4	1	-4
	1	-4	1	-4	0

4	1	-4	1	-4
	↓	4	0	4
	1	0	1	0

$x^2 + 1 = 0$

$x^2 = -1$

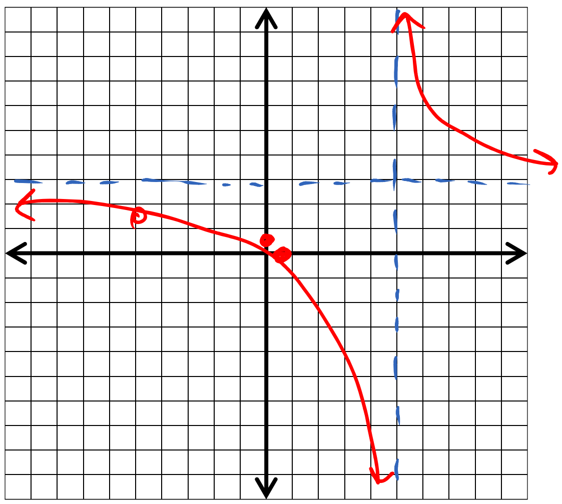
$x = \pm i$

30. Write a polynomial of minimum degree in factored form that has zeros of 4 and 1 + 2i. **

zeros: $4,\ 1+2i,\ 1-2i$

factored form: $f(x) = (x-4)(x-(1+2i))(x-(1-2i))$

31. Graph the function. Include any asymptotes (vertical, horizontal, slant), removable discontinuities, x- and y-intercepts, and end behavior. $g(x)=\dfrac{3x^2+13x-10}{x^2-25}$ ** $\Rightarrow g(x)=\dfrac{(3x-2)\cancel{(x+5)}}{(x-5)\cancel{(x+5)}}$



V.A: $x=5$
H.A.: $y=3$
S.A.: n/a
R.D.: $(-5, 17/10)$
x-int: $(2/3, 0)$
y-int: $(0, 2/5)$

$\lim\limits_{x\to 5^-} g(x) = -\infty$

$\lim\limits_{x\to 5^+} g(x) = \infty$

$\lim\limits_{x\to -\infty} g(x) = 3$

$\lim\limits_{x\to \infty} g(x) = 3$

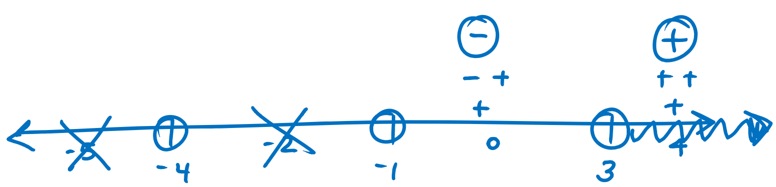
32. Solve for x. Check for extraneous solutions. $\dfrac{x}{x-2}+\dfrac{1}{x-4}=\dfrac{2}{x^2-6x+8}$ **

$(x-4)(x-2)$

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

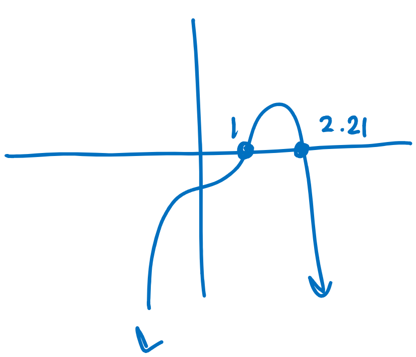
$(x-4)(x+1)=0$
$x=\cancel{4}, \boxed{-1}$

33. Solve the inequality. Create a sign chart! $\dfrac{(x-3)|x+4|}{\sqrt{x+1}}>0$ **



$\boxed{(3,\infty)}$

34. Solve the inequality using your graphing calculator: $-x^4+3x^3-2x^2+x-1<0$



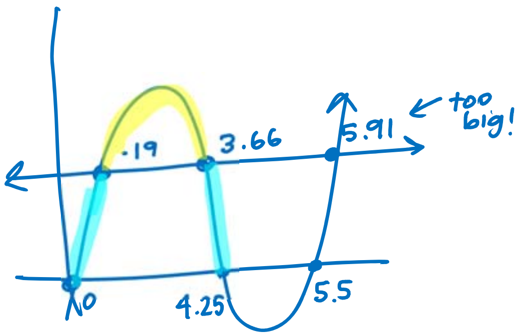
$\boxed{(-\infty, 1) \cup (2.21, \infty)}$

35. Using a pair of scissors, you cut congruent squares off of the four corners of an 8.5" by 11" piece of card stock. Once the squares are cut off, you fold up the sides to form an open box (a box without a top).

a. If you want the box to have a volume of <u>at least</u> 16 cubic inches, what size squares could have been cut from the cardstock?

$16 \le x(8.5-2x)(10-2x)$

$\boxed{[.19, 3.66]}$



b. If you want the box to have a volume <u>no more than</u> 16 cubic inches, what size squares could have been cut from the cardstock?

$16 \ge x(8.5-2x)(10-2x)$

$\boxed{(0, .19] \cup [3.66, 4.25)}$