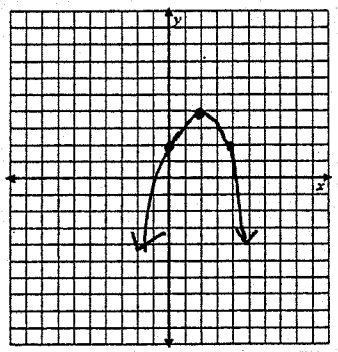
1st Semester Ch. 2
Honors Pre Calculus Review
Non-Calculator
Mrs. Wilson

Name: Key
Block: _____

For 1-2, find the vertex and axis of the function. Sketch the graph and identify at least three points. Label your axis with the scale you chose!

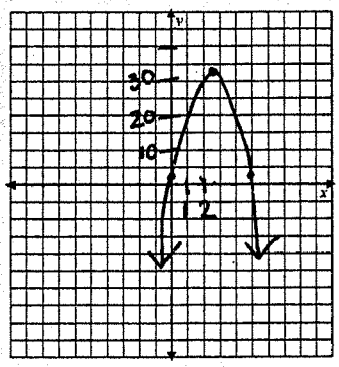
1. $f(x) = -0.5(x-2)^2 + 4$



[1] Vertex: (2, 4)

Axis: $x = 2$

2. $f(x) = -5x^2 + 25x + 2$



[2] Vertex: (2.5, 33.25)

Axis: $x = 2.5$

$h = \frac{-b}{2a} = \frac{-25}{-10} = 2.5$

$f(2.5) = -5(2.5)^2 + 25(2.5) + 2$

$= 33.25$

3. Write and equation for the quadratic function whose graph contains the vertex (-4,3) and point (-2,-2). Leave in vertex form.

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

$-2 = a(2)^2 + 3$

$-5 = 4a$

$a = -5/4$

[3] $y = -5/4\,(x+4)^2 + 3$

For 4-6, determine if the function is a power and/or monomial function. For those that are, state the power and constant of variation, or the degree and the leading coefficient. For those that are not, explain why not.

4. $f(x) = -3x^{-3}$

[4] power
power : -3
c. of v : -3

5. $f(x) = 12x^{\frac{8}{4}}$

[5] power & mono
power/degree : 2
lc or c. of v = 12

6. $f(x) = 3.9^{x^0}$

[6] mono
degree: 0 lc: 3.9

7. The volume of an enclosed gas (at a constant temperature) varies inversely with the pressure. If the pressure of a 3.46 L sample of neon gas at 302 K is 0.926 atm, what would the volume be at the pressure of 1.452 atm if the temperature does not change? (You may use your calculator for this problem).

$V = \frac{kT}{P}$

$3.46 = \frac{k(302°)}{.926}$

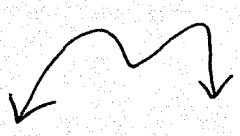
$k = .0106$

[7] $V = 2.2$ l

$V = \frac{(.0106)(302)}{1.452} = 2.2$

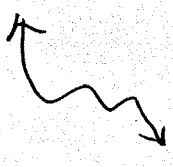
In 8-9, describe the end behavior of the polynomial function using $\lim_{x\to+\infty} f(x)$ and $\lim_{x\to-\infty} f(x)$

8. $f(x) = -5x^4 + 3x + 7$



[8] $\lim_{x\to\pm\infty} f(x) = -\infty$

9. $f(x) = -3x^5 + 6x^2 - 1$



[9] $\lim_{x\to+\infty} f(x) = -\infty$, $\lim_{x\to-\infty} f(x) = +\infty$

In 10-11, state the degree and the zeros of the polynomial function. State the multiplicity of each zero.

10. $f(x) = 3x^3 - 18x^2 + 27x$

[10] degree 3; 0, 3 (mult of 2)

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

[11] degree: 6
zeros: 0, -4 (mult 2), -1 (mult 3)

12. Divide and write a summary statement in fraction form and polynomial form.

$$\frac{x^4 - 2x^3 + 3x^2 - 4x + 6}{x^2 + 2x - 1}$$

$x^2 - 4x + 12$

$x^2+2x-1 \;\overline{)\; x^4 - 2x^3 + 3x^2 - 4x + 6}$

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

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

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

$12x^2 - 8x + 6$

$12x^2 + 24x - 12$

$-32x + 18$

[12] $= x^2 - 4x + 12 + \frac{-32x+18}{x^2+2x-1}$

$(x^2+2x-1)(x^2-4x+12) - 32x + 18$

13. Write a linear equation for the given information $f(-2) = 5$ and $f(3) = -7$. Put your answer in standard form. (-2, 5) (3, -7)

$\frac{-12}{5} = \frac{-12}{5}$

$y = \frac{-12}{5}x + b$

$5 = -\frac{12}{5}(-2) + b$

$5 = \frac{24}{5} + b$

$\frac{1}{5} = b$

[13] $-12x - 5y + 1 = 0$

$y = -\frac{12}{5}x + \frac{1}{5}$

$5y = -12x + 1$

14. Find a polynomial function with a leading coefficient of 3 and zeros of $\frac{1}{3}$, -1 and 4. Write answer in standard form.

$f(x) = (3x-1)(x+1)(x-4)$

$(3x-1)(x^2-3x-4)$

$3x^3 - 9x^2 - 12x$

$-x^2 + 3x + 4$

[14] $3x^3 - 10x^2 - 9x + 4$

15. List all possible rational zeros of the function: $f(x) = 5x^3 - 7x + 4$

$\pm 1, \pm 2, \pm 4$

$\pm 1, \pm 5$

[15] $\pm 1, \pm \frac{1}{5}, \pm 2, \pm \frac{2}{5}, \pm 4, \pm \frac{4}{5}$

16. Find all zeros of the function below given that -1 and $\frac{3}{2}$ are zeros. Hint: Use synthetic division.

$g(x) = 4x^4 - 4x^3 - 11x^2 + 6x + 9$

-1 | 4 -4 -11 6 9
-4 8 3 -9
4 -8 -3 9 0

3/2 | 6 -3 -9
4 -2 -6 0

[16] -1 (mult. of 2)
3/2 (mult. of 2)

$4x^2 - 2x - 6 = 0$

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

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

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

17. Simplify

(a) $\sqrt{-16}$ [17a] $4i$

(b) $\sqrt{-125}$ [17b] $5i\sqrt{5}$

18. Perform the following operations…

(a) $(3-4i)-(-8+2i)$ [18a] $11-6i$

(b) $(2+9i)(4-6i)$ [18b] $62+24i$

$8-12i$
$+36i+54i^2$

(c) $\frac{3+i}{2-3i}\ (2+3i)$ [18c] $3/13 + 11/13\,i$

$(2+3i)$

$\frac{6+9i+2i+3i^2-3}{4+9}$

19. Solve algebraically.

(a) $2x^2+20x=-82$ [19a] $-5\pm 4i$

$2x^2+20x+82$

$2(x^2+10x+41)$

$x=\frac{-10\pm\sqrt{100-164}}{2}=\frac{-10\pm 8i}{2}$

(b) $x^2+6x+25=0$ [19b] $-3\pm 4i$

$\frac{-6\pm\sqrt{36-100}}{2}=\frac{-6\pm 8i}{2}$

20. Write a polynomial function in standard form with real coefficients with the given zeros.

(a) -2, $4-5i$ [20a] $x^3-6x^2+25x+82$

$f(x)=(x+2)(x-(4-5i))(x-(4+5i))$

$(x+2)((x-4)+5i)((x-4)-5i))$

$(x+2)[(x-4)^2+25)$

$(x+2)(x^2-8x+16+25)$

$(x+2)(x^2+8x+41)$

x^3+8x^2+41x

$+2x^2-16x+82$

(b) 3, $2i$ [20b] $x^3-3x^2+4x-12$

$(x-3)(x-2i)(x+2i)$

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

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

In 21-22, (a) Find the asymptotes of the function's graph and (b) Tell how the function's graph is related to a hyperbola with the equation of the form $f(x)=\frac{a}{x}$

21. $g(x)=\frac{3x+11}{x+2}$

$$x+2\overline{)\,3x+11}\quad 3,\ 3x+6,\ 5$$

$y=\frac{5}{x+2}+3$

[21a] $x=-2$ $y=3$

[21b] moved left 2, up 3 & vert. stretch of 5

22. $h(x)=\frac{8x+14}{2x-3}$

$$2x-3\overline{)\,8x+14}\quad 4,\ 8x-12,\ 26$$

[22a] $x=3/2$, $y=4$

[22b] moved rt 3/2, 4 up & V.S. of 13

$y=\frac{26}{2x-3}+4$

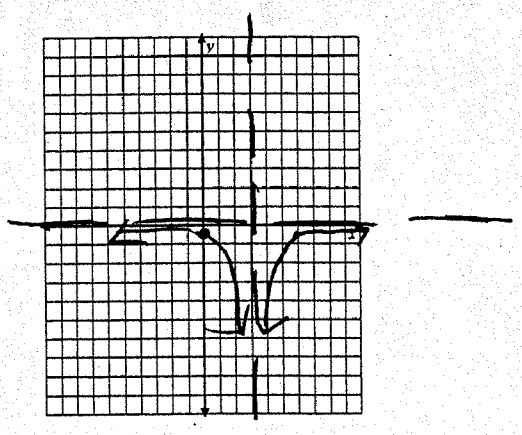
$=\frac{26}{2(x-3/2)}+4=\frac{13}{x-3/2}+4$

For 23-25, find the asymptotes, intercepts, holes (if any) and graph the function (label at least 1-2 points per region...enough to clearly determine shape!)

23. $f(x)=\frac{-2}{(x-3)^2}$

[23]

- $x=3$ (vert asy.)
- no x-int
- y-int $=-2/9$



24. $g(x)=\frac{x}{1-x^2}$

$(1-x)(1+x)$

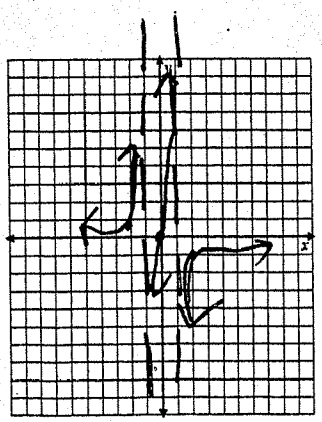
asy: $x=1$ $x=-1$ $y=0$

x-int: (0,0)

y-int. (0,0)

[24]

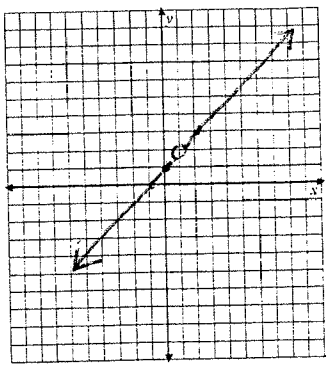
x	y
-2	2/3
2	-2/3
.5	.5/+
-.5	-



25. $h(x)=\dfrac{x^2-1}{x-1}$ $=\dfrac{(x-1)(x+1)}{(x-1)}$ [25]

hole @ $x=1$

graph of $y=x+1$



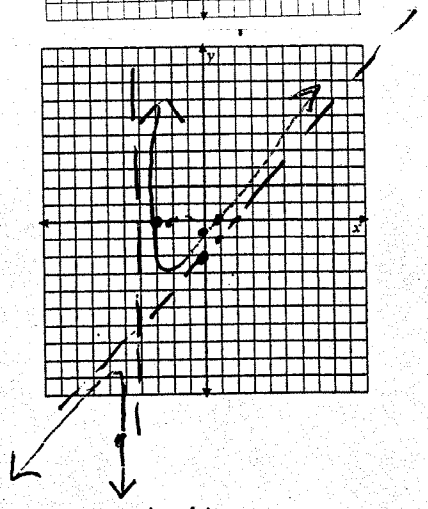
26. $g(x)=\dfrac{x^2+2x-3}{x+4}$ $(x+3)(x-1)$ [26]

$$x+4 \;\overline{)\; x^2+2x-3}$$

$x-2$

x^2+4x

$-2x-3$



asy: $x=-4$ & $y=x-2$

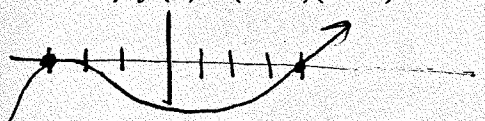
x	y
-5	25-10-3 = 12/-1 = -12

x-int: $(-3,0)(1,0)$

y-int: $(0,-3/4)$

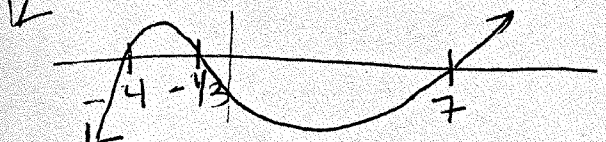
27. Determine the real number values that make f(x) be
i) zero
ii) positive and
iii) negative

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



[27a i] zero: 4, -3
ii] pos: $(4,\infty)$
iii] neg: $(-\infty,-3)\cup(-3,4)$

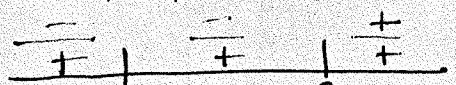
b) $g(x)=(x-7)(3x+1)(x+4)$



b i] zero: 7, -1/3, -4
ii] $(-4,-1/3)\cup(7,\infty)$
iii] $(-\infty,-4)\cup(-1/3,7)$

28. Solve the inequality

a) $\frac{x-3}{|x+2|}<0$ zero: 3 und: -2

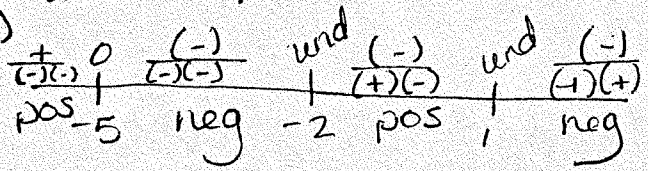


[28a] $(-\infty,-2)\cup(-2,3)$

b) $\frac{1}{x+2}-\frac{2}{x-1}\geq 0$

$\frac{(x-1)-(2x+4)}{(x+2)(x-1)}\geq 0 \rightarrow \frac{-x-5}{(x+2)(x-1)}$

b] $(-\infty,-5]\cup(-2,1)$
zero: -5
und: -2, 1



CALCULATOR

29. The table below shows the number of employees of the gizmo company.

Year	1972	1975	1978	1980	1983	1989
Number of employees	247	475	658	546	493	605

a. Find the cubic regression equation, using x = 0 to represent 1970. Round the coefficients to the nearest .0001.

[29a] $.6119x^3-21.2259x^2+220.8564x-127.7337$

b. Use the regression equation to predict the number of employees in 1985.

b] 474.45

30. Use a grapher go approximate all of the functions real zeros. Round to the nearest .01.

$f(x)3x^6 - 5x^5 - 4x^3 + x^2 + x + 1$

[30] .75 and 1.94

Previous Chapter Review

31. Identify the interval in which the function is increasing, decreasing, and/or constant.

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

[31] inc: $(-\infty, 0) \cup (1, \infty)$
dec: $(0, 1)$

32. Let $f(x) = x^2 - 1$ and $g(x) = \frac{1}{x-1}$. Find and simplify

a. $g(f(x))$

$g(x^2-1) = \frac{1}{x^2-1-1} = \frac{1}{x^2-2}$

[32a] $\frac{1}{x^2-2}$

b. $\frac{f}{g}(x)$ $\frac{x^2-1}{\frac{1}{x-1}} = (x^2-1)(x-1)$

[32b] $x^3 - x^2 - x + 1$

33. How much 10% solution and how much 45% solution should be mixed together to make 70 gallons of 28% solution?

$.10x + .45y = .28(70)$

$x + y = 70$

$\begin{bmatrix} .10 & .45 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 19.6 \\ 70 \end{bmatrix}$

[33] 34 gal (10%)
36 gal (45%)

34. Solve: $-1 \le 6x + 3 < 9$

$-4 \le 6x < 6$

$-2/3 \le x < 1$

[34] $-2/3 \le x < 1$