Name Key

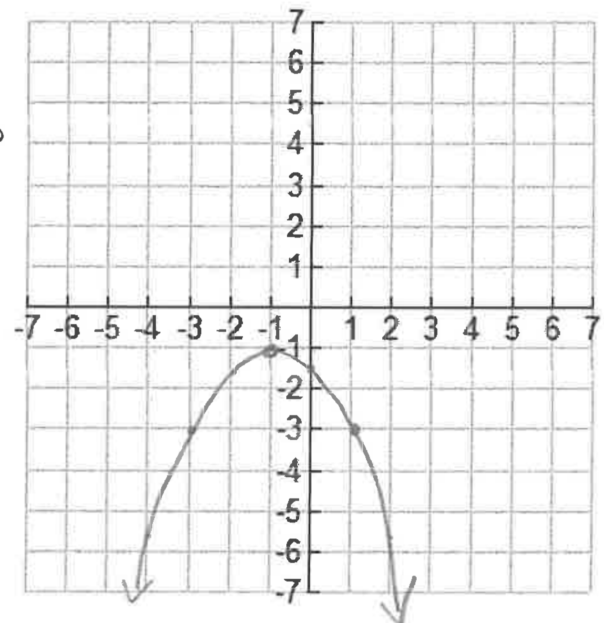
Honors PreCalc – Chapter 2 Homework Packet

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

a) Name the transformations that relate $g(x)$ to $f(x)$.

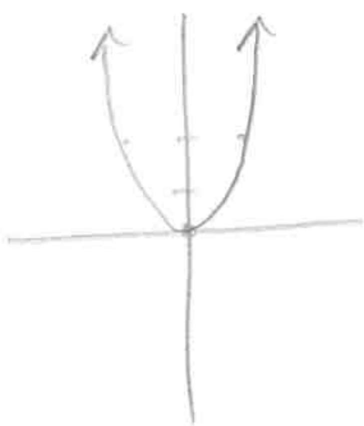
reflection over the x-axis
shift left 1 and down 1
vertical shrink of $\frac{1}{2}$

b) Graph $g(x)$.

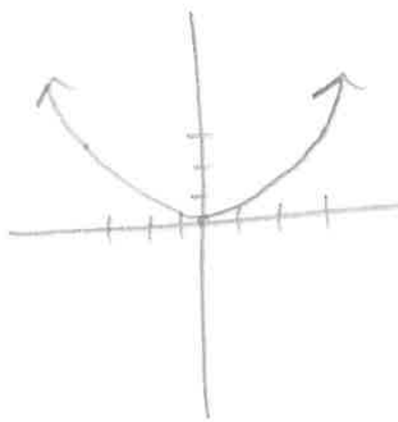


2) Sketch the graph of each equation. You do not need to show specific points, just the general shape and location in the coordinate plane.

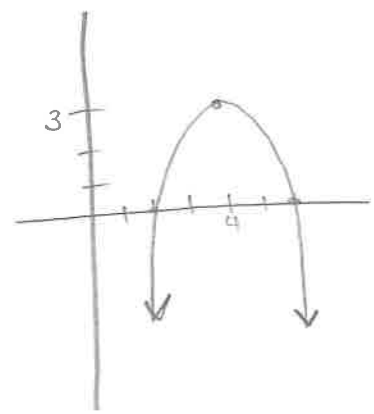
a) $y=2x^2$



b) $y=\frac{1}{3}x^2$



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



3) Name the vertex of each function.

a) $y=-\frac{3}{8}x^2+7x-11$

$\left(\frac{28}{3}, \frac{65}{3}\right)$

b) $y=-\left(x+\frac{1}{4}\right)^2-18.3$

$\left(-\frac{1}{4}, -18.3\right)$

4) Convert each function from standard form to vertex form, or vice versa.

a) $y=-\frac{1}{6}(x+3)^2$

$y=-\frac{1}{6}(x^2+6x+9)$

$\boxed{y=-\frac{1}{6}x^2-x-\frac{3}{2}}$

b) $y=3x^2-\frac{12}{5}x+\frac{32}{5}$

$\boxed{y=3(x-\frac{2}{5})^2+\frac{148}{25}}$

c) $y=x^2-7x+4$

$\boxed{y=(x-\frac{7}{2})^2-\frac{33}{4}}$

5) Determine the *x*-intercepts and *y*-intercept of each function.

a) $y=-x^2-x+\frac{7}{2}$ x-int. $\left(\frac{1+\sqrt{15}}{-2}, 0\right)$

$\left(\frac{1-\sqrt{15}}{-2}, 0\right)$

y-int. $(0, \frac{7}{2})$

b) $y=(3x+11)(-x-5)$

x-int. $(-5,0)$

$(\frac{-11}{3}, 0)$

y-int. $(0,-55)$

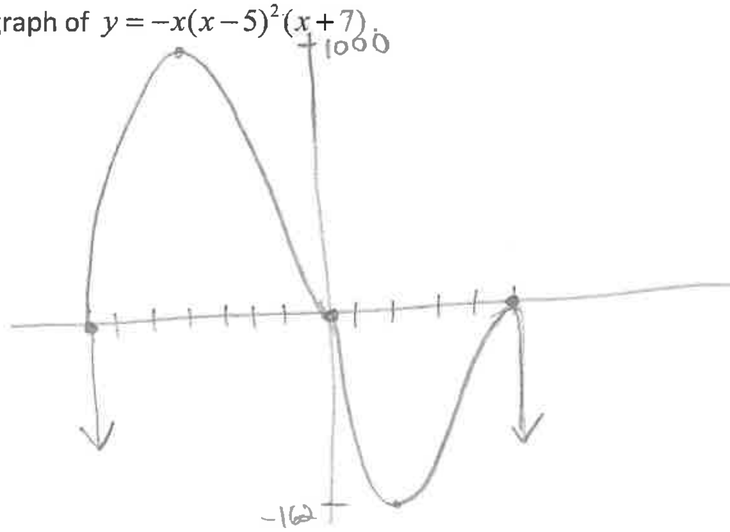
6) A Stomp Rocket is launched off the ground. After 2.5 seconds it reaches its maximum height of 100 feet. What is the equation that relates the height (in feet) of the rocket as a function of time? (Hint: using vertex form $y=a(x-h)^2+k$ might be helpful for this problem). vertex $(2.5, 100)$

pt: $(0,0)$

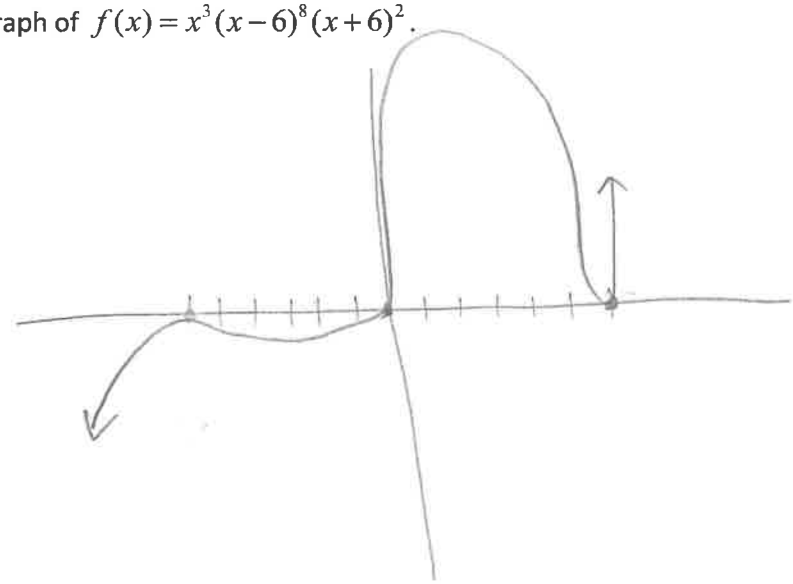
$y=a(x-2.5)^2+100$

$\boxed{y=-16(x-2.5)^2+100}$

7) Sketch the graph of $y=-x(x-5)^2(x+7)$.



8) Sketch the graph of $f(x)=x^3(x-6)^8(x+6)^2$.



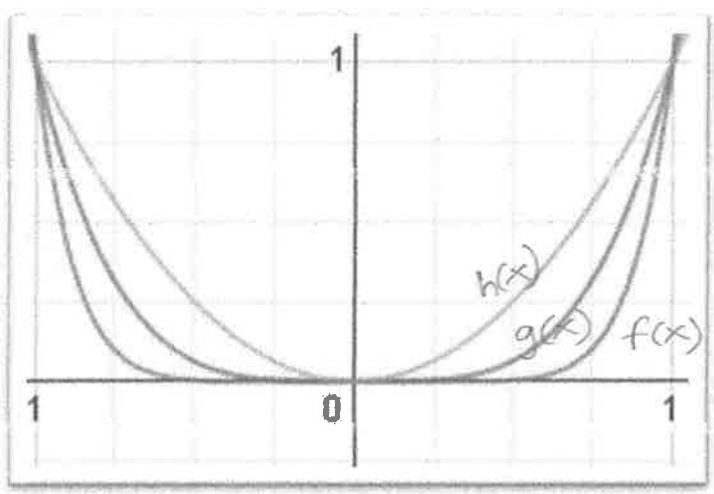
9) Zeros that are repeated an even number of times "bounce back" off of the *x*-axis. Why is that true? Why do zeros that are repeated an odd number of times "pass through" the *x*-axis? If you need a hint, think of a graph for each situation and observe what happens to the left and right of the zero.

even - the sign does not change on either side of the zero

odd - the sign changes on either side of the zero.

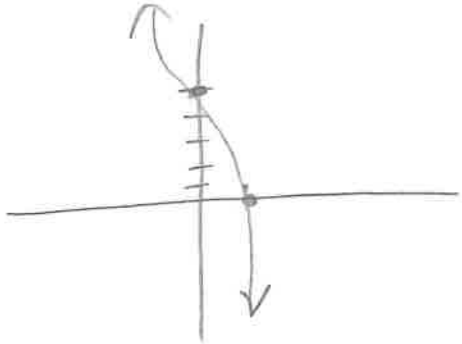
10) The functions $f(x)=x^8$, $g(x)=x^4$, and $h(x)=x^2$ are represented in the graph below. Which function is which? How do you know?

blue = f(x)
red = g(x)
green = h(x)

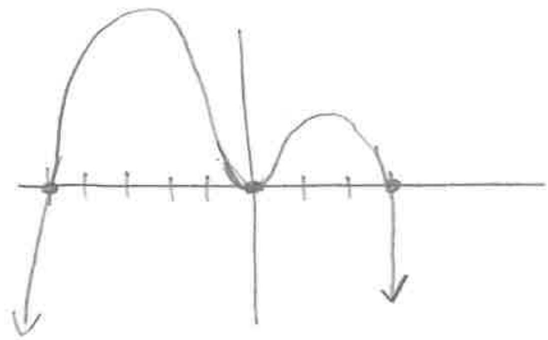


Sketch the graph of each function.

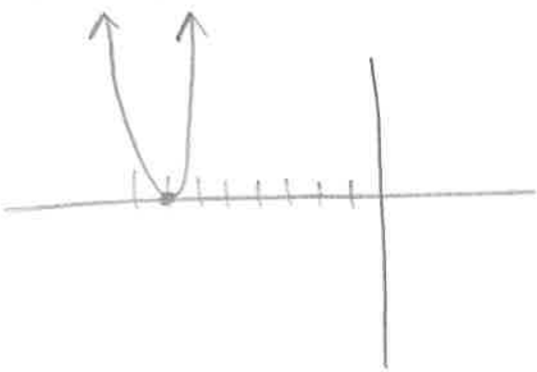
11) $f(x) = 5 - 4x - x^3$



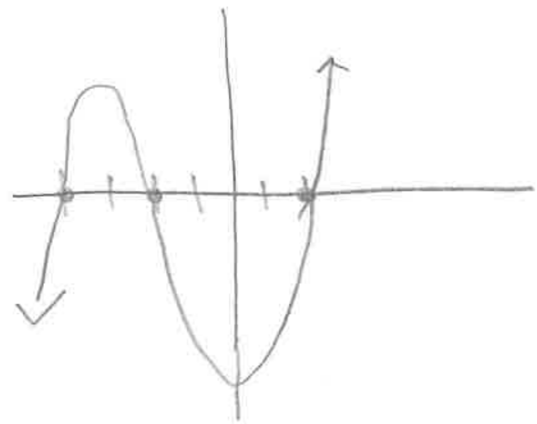
12) $f(x) = -x^4(x-3)^3(x+5)$



13) $y = (x+7)^{12}$



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



15) Write two different polynomial functions that have the zeros 9, 3, and 2.

examples: $f(x) = (x-9)(x-3)(x-2)$

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

16) Write a polynomial function with the *same* left and right end behavior that has the zeros 1, 0, and -4.

example:

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

17) Write a polynomial function with *different* left and right end behavior that has the zeros 1, 0, and -4

example:

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

18) Write a polynomial function that has the zeros 0, $(1+\sqrt{3})$, and $(1-\sqrt{3})$. example:

sum: 2

product: $1-3=-2$

x^2-2x-2

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

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

19) Divide the polynomials.

a) $\dfrac{2x^2+10x+12}{x+3} = \boxed{2x+4}$

$$\begin{array}{r|rrr} -3 & 2 & 10 & 12 \\ & & -6 & -12 \\ \hline & 2 & 4 & 0 \end{array}$$

b) $\dfrac{x^4+3x^3-8x^2+10x-2}{x^2-x+3}$

$$\boxed{x^2+4x-7+\frac{-9x+19}{x^2-x+3}}$$

c) $\dfrac{4x^3-7x^2-11x+5}{4x+5} = \boxed{x^2-3x+1}$

d) $\dfrac{x^5+8}{x^2-3x+7}$

$$\boxed{x^3+3x^2+2x-15+\frac{-59x+113}{x^2-3x+7}}$$

e) $\dfrac{-x^3+x+2}{x+\frac{1}{2}}$

$$-x^2+\frac{1}{2}x+\frac{3}{4}+\frac{\frac{13}{8}}{x+\frac{1}{2}}$$

$$= \boxed{-x^2+\frac{1}{2}x+\frac{3}{4}+\frac{13}{8x+4}}$$

f) $\dfrac{x^4}{(x+1)^3}$

$$\boxed{x-3+\frac{6x^2+8x+3}{(x+1)^3}}$$

20) Suppose $f(x)=3x^4-6x+9$. Use the Remainder Theorem to determine $f(8)$.

$$\begin{array}{r|rrrrr} 8 & 3 & 0 & 0 & -6 & 9 \\ & & 24 & 192 & 1536 & 12240 \\ \hline & 3 & 24 & 192 & 1530 & 12249 \end{array}$$

$f(8)=\boxed{12,249}$

21) Suppose $g(x)=11x^5-x^4+x^3$. Use the Remainder Theorem to find $g(-6)$.

$$\begin{array}{r|rrrrrr} -6 & 11 & -1 & 1 & 0 & 0 & 0 \\ & & -66 & 402 & -2418 & 14,508 & -87,048 \\ \hline & 11 & -67 & 403 & -2418 & 14,508 & -87,048 \end{array}$$

$g(-6)=\boxed{-87,048}$

22) Use synthetic division to show that *x* is a solution of the third-degree polynomial equation. Then use the result to factor the polynomial completely.

$2x^3-15x^2+27x-10=0;\ x=\frac{1}{2}$

$$\begin{array}{r|rrrr} \frac{1}{2} & 2 & -15 & 27 & -10 \\ & & 1 & -7 & 10 \\ \hline & 2 & -14 & 20 & 0 \end{array}$$

$(2x-1)(x^2-7x+10)$

$\boxed{(2x-1)(x-5)(x-2)=0}$

23) For each function in the table below, write an equivalent version. The first problem has been completed for you.

Function	Equivalent Version
$f(x)=\dfrac{x^2+6x-1}{x-2}$	$f(x)=x+8+\dfrac{15}{x-2}$
$g(x)=\dfrac{4x^3+10x-3}{x+4}$	$g(x)=4x^2-16x+74-\dfrac{299}{x+4}$
$h(x)=\dfrac{x^2+5x+1}{x+1}$	$h(x)=x+4-\dfrac{3}{x+1}$

24) Use your graphing calculator to find the zeros of each function. Round to two decimal places if the zero is not a whole number.

a) $y=x^3-2x^2-5x+10$

-2.24
2.24
2

b) $h(x)=x^3-4x^2-2x+8$

-1.41
1.41
4

25) Determine all zeros of the following polynomial functions. Leave each as an exact answer. For repeated zeros, specify how many times they are repeated.

a) $y = x^4 - x^3 - 2x - 4$

$\boxed{-1,\ 2,\ \pm i\sqrt{2}}$

b) $f(x) = 11x^3 - 60x^2 - 371x + 180$

$\boxed{-4,\ 9,\ \frac{5}{11}}$

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

$\boxed{0,\ -2,\ 1 \text{ (triple root)}}$

d) $y = x^4 + 13x^2 + 36$

$\boxed{\pm 3i,\ \pm 2i}$

e) $f(x) = x^4 - 4x^3 + 8x^2 - 16x + 16$

$\boxed{\pm 2i,\ 2 \text{ (double root)}}$

26) Sophia claims that it is possible for a polynomial function to have exactly one imaginary zero. Do you agree with her? Why or why not?

No, imaginary roots will always be in conjugate pairs.

27) Martin deduces that it is possible for a polynomial function to have its only imaginary factors as $(x-3i)$ and $(x+2i)$. Do you agree with him? Why or why not?

No, imaginary roots will always be in conjugate pairs.

28) Determine a polynomial function with integer coefficients that has the given zeros. Write the polynomial in standard form.

a) 1, 5*i*, -5*i*

$\boxed{f(x) = x^3 - x^2 + 25x - 25}$

b) $2,\ 4+i,\ 4-i$

$\boxed{f(x) = x^3 - 10x^2 + 33x - 34}$

c) $-5, -5, 1+\sqrt{3}i$

sum -10
product 25

sum: 2
prod. $1 - 3i^2$
$= 4$

$(x^2 + 10x + 25)(x^2 - 2x + 4)$

$x^4 - 2x^3 + 4x^2$
$+ 10x^3 - 20x^2 + 40x$
$+ 25x^2 - 50x + 100$

$\boxed{f(x) = x^4 + 8x^3 + 9x^2 - 10x + 100}$

29) Given that $-3+i$ is a zero of $f(x) = 4x^3 + 23x^2 + 34x - 10$, determine the other zeros of the function.

$\boxed{\begin{matrix} -3 - i \\ \frac{1}{4} \end{matrix}}$

30) Solve each inequality. Make a sign diagram for each and write your answer in interval notation.

a) $x^3 + 7x^2 - 4x - 28 > 0$

− + − +
-7 -2 2

$(-7, -2) \cup (2, \infty)$

b) $10 \le 4a^2 - 39a$

+ − +
$-\frac{1}{4}$ 10

$(-\infty, -\frac{1}{4}] \cup [10, \infty)$

c) $\dfrac{(y+5)(y-9)}{(y+3)y} < 0$

+ − + − +
-5 -3 0 9

$\boxed{(-5, -3) \cup (0, 9)}$

d) $0 \ge \dfrac{x^2 - 3x - 18}{(x-1)^2}$

+ − − +
-3 1 6

$\boxed{[-3, 1) \cup (1, 6]}$

e) $\dfrac{4}{x+5} > -8$

+ − +
$-\frac{11}{2}$ -5

$\boxed{(-\infty, -\frac{11}{2}) \cup (-5, \infty)}$

f) $\dfrac{x+2}{x+3} \le \dfrac{x-1}{x-2}$

+ − + −
-3 $-\frac{1}{2}$ 2

$\boxed{(-3, -\frac{1}{2}] \cup (2, \infty)}$

31) Determine the domain of each function.

a) $g(x)=\sqrt{x^2+5x+6}$

$\boxed{(-\infty,-3]\cup[-2,\infty)}$

b) $p(t)=\sqrt{\dfrac{(t+8)(4-t)}{t-2}}$

$\boxed{(-\infty,-8]\cup(2,4]}$

32) Fake High School is planning another dance! This time it is the Snowcoming dance. The tickets are going to be \$60 and then there will be a \$0.50 discount for every student who attends the dance. Also, the school is going to spend \$600 to rent snow machines that will cover the gym floor in real snow. The \$600 cost will be split evenly among those who attend the dance.

a) Create a function to represent the cost *y* of the tickets if *x* students attend the dance.

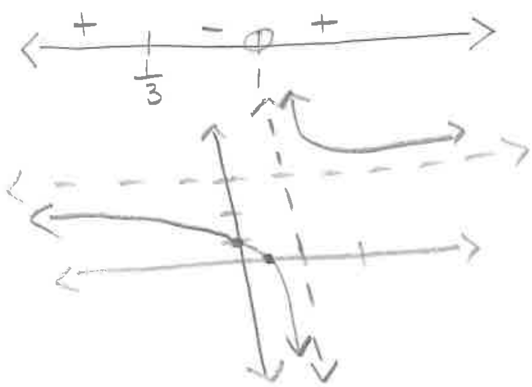
$Y=60-0.5X+\dfrac{600}{X}$

b) How many students must attend the dance for the cost to be less than \$40 per student?

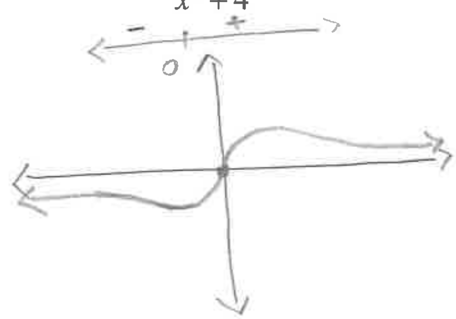
more than 60 students

33) Make a sign diagram and sketch the graph.

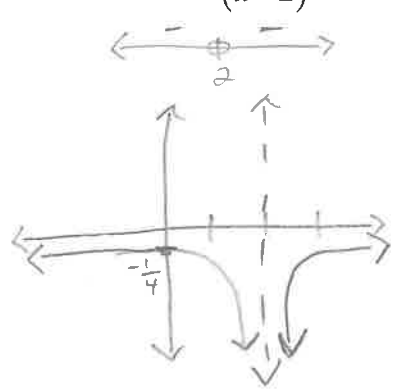
a) $P(x)=\dfrac{1-3x}{1-x}$



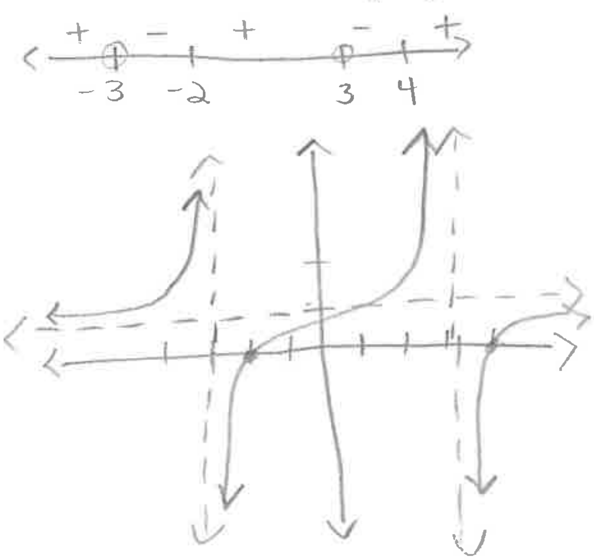
b) $g(x)=\dfrac{4x}{x^2+4}$



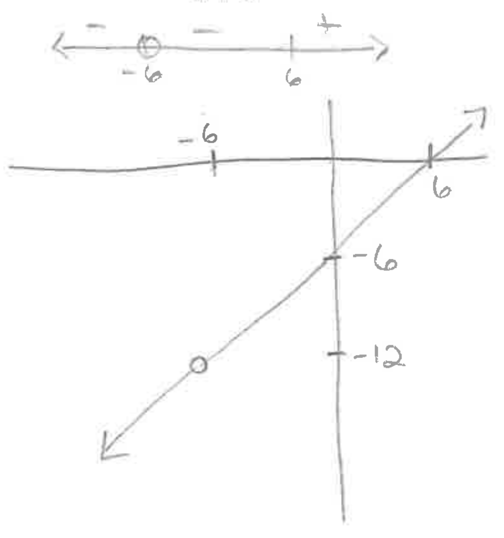
c) $f(x)=-\dfrac{1}{(x-2)^2}$



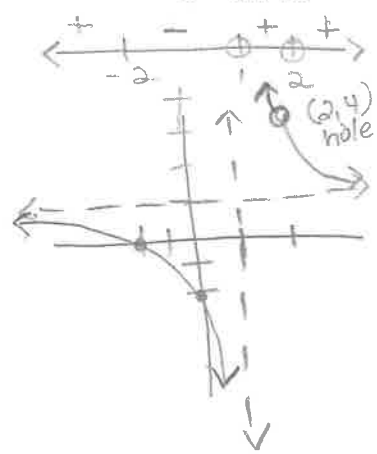
d) $g(x)=\dfrac{x^2-2x-8}{x^2-9}$



e) $f(x)=\dfrac{x^2-36}{x+6}$ hole$(-6,-12)$

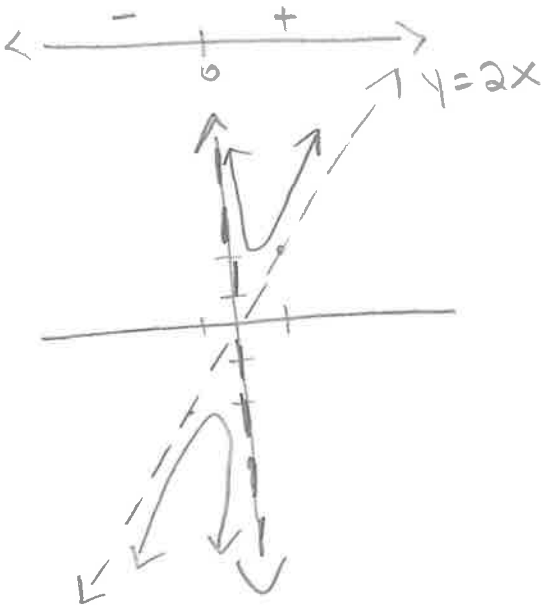


f) $f(x)=\dfrac{x^2-4}{x^2-3x+2}$

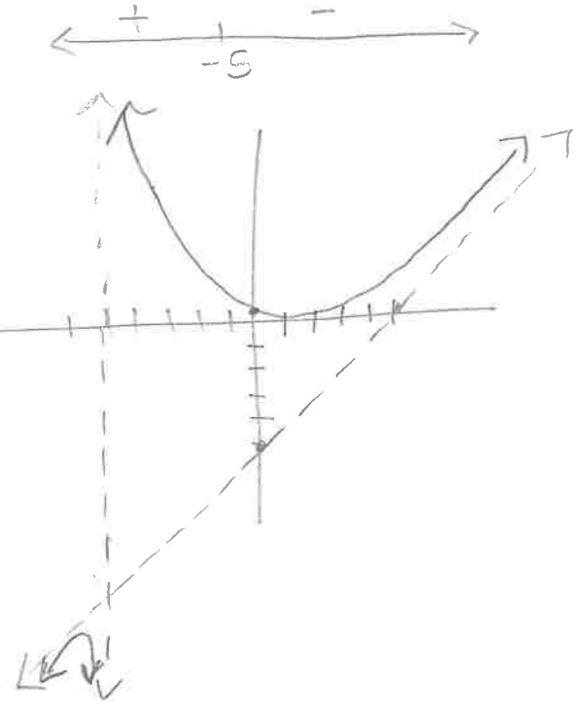


34) Sketch the graph.

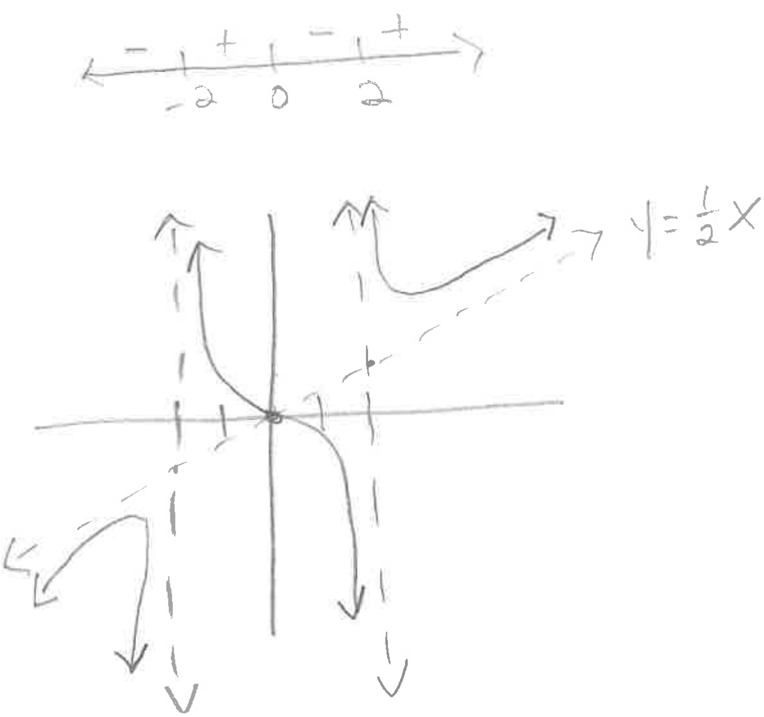
a) $f(x)=\dfrac{2x^2+1}{x}$



b) $f(t)=\dfrac{t^2+1}{t+5}$



c) $g(x)=\dfrac{x^3}{2x^2-8}$



d) $f(x)=\dfrac{2x^3-x^2-2x+1}{x^2+3x+2}$