

Name: _____
 PC: Oblique Asymptotes

Date: _____
 Ms. Loughran

Do Now:

1. Find the vertical asymptote(s) of the function $y = \frac{x+6}{x^2-36} = \frac{1}{x-6}$

$x-6=0$
 $x=6$

2. Find the horizontal asymptote of the function $y = \frac{x^2+2x+1}{x+1}$

none

3. Is there a hole in the graph of $y = \frac{x^2+9}{x+3}$?

No

4. What is the domain of the function $y = \frac{x^2-x-12}{x-4}$?

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

A line with a hole @ (4, 7)

D: $x \neq 4$

5. Are there any x- or y- intercepts for the graph of $y = \frac{(x+1)(3x-2)}{3x^2+x-2}$? If so, state them.

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

hole: (-1, -5)

x-int. $0 = 3x-2$ $(\frac{2}{3}, 0)$ y-int. $y = 3(0)-2$ $(0, -2)$
 $x = \frac{2}{3}$ $y = -2$

When the end behavior of a rational function is not horizontal (meaning there is no horizontal asymptote), it is oblique.

Recall: In what situation is there no horizontal asymptote for a rational function?

When the degree of the numerator > the degree of the denominator

To find oblique asymptotes:

1. reduce the function if possible
2. divide the numerator by the denominator using long or synthetic division
3. the oblique asymptote is $y =$ the quotient

1. Find the oblique asymptote of $y = \frac{x^2-3x+5}{x+2}$

$-2 \overline{) 1 \quad -3 \quad 5}$
 $\quad \quad -2 \quad 10$
 $\hline 1 \quad -5 \quad 15$

ignore the remainder

OA: $y = x-5$

2. Find the oblique asymptote of $y = \frac{x^2}{x+1}$.

$$\begin{array}{r|rrr} -1 & 1 & 0 & 0 \\ & & -1 & 1 \\ \hline & 1 & -1 & 1 \end{array}$$

remainder ignore it

OA: $y = x - 1$

3. Find the oblique asymptote for $y = \frac{x^2 - 4}{x}$

$$\begin{array}{r|rr} x & x^2 & -4 \\ & -x^2 & \\ \hline & & -4 \end{array}$$

ignore remainder

OA: $y = x$

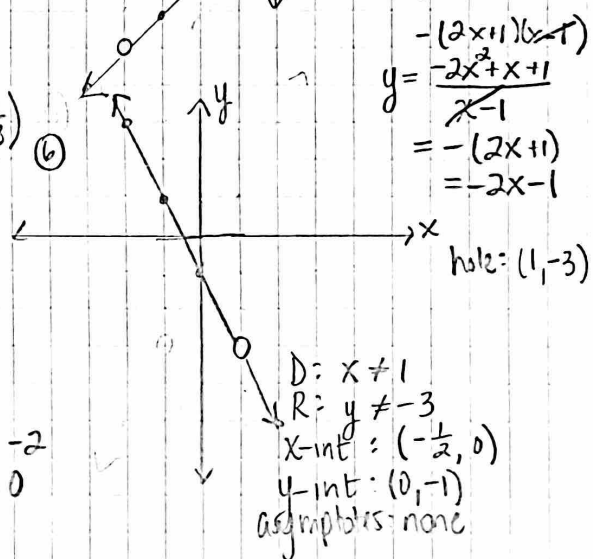
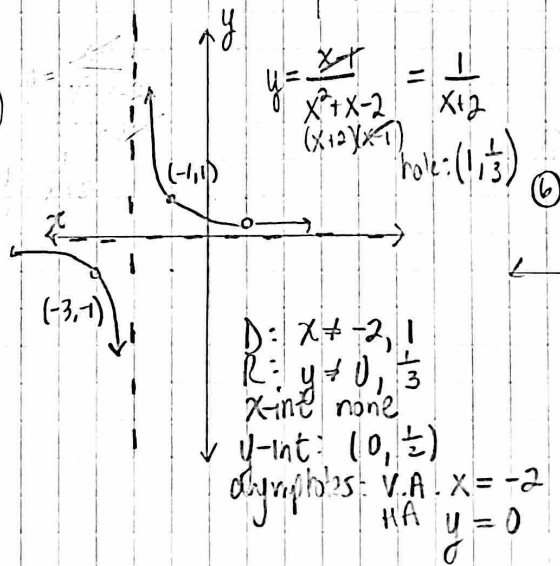
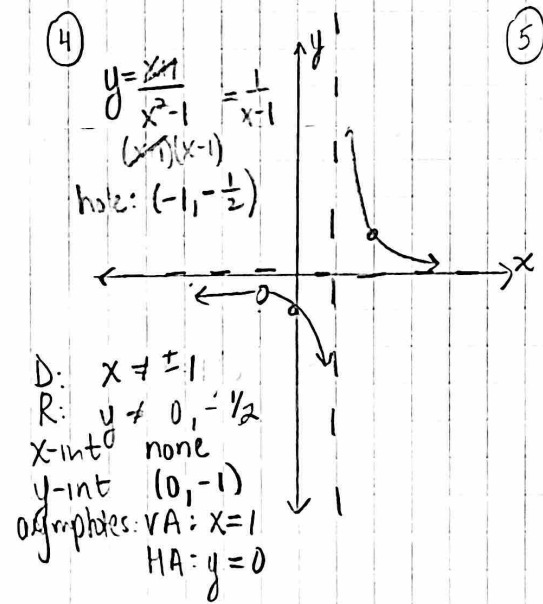
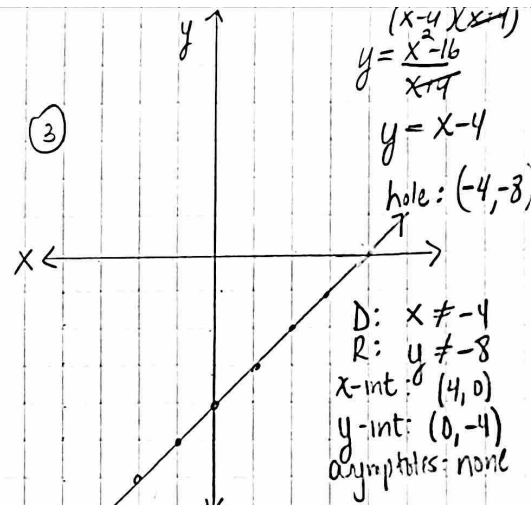
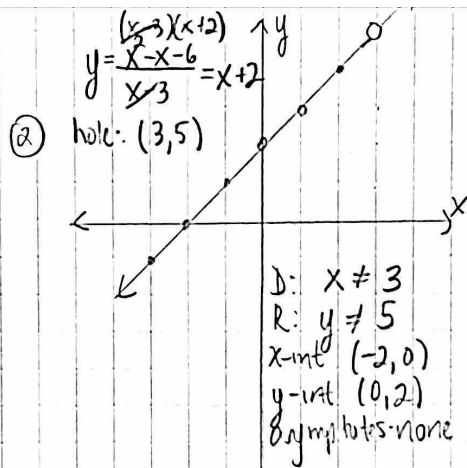
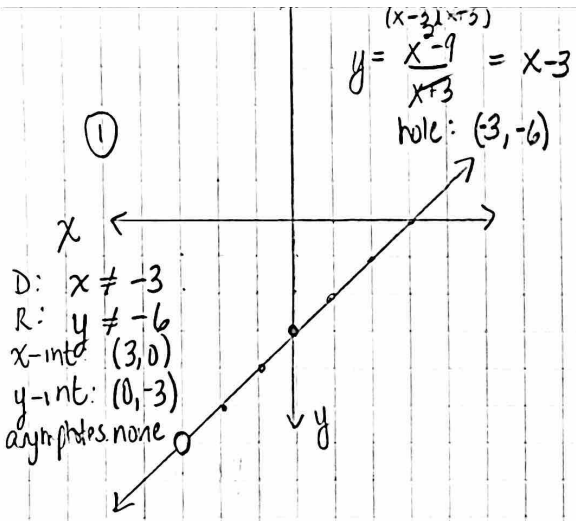
4. Find the oblique asymptote of $y = \frac{x^2 - 1}{-x + 3}$
 $-(x-3)$

$$\begin{array}{r|rrr} 3 & 1 & 0 & -1 \\ & & 3 & 9 \\ \hline & 1 & 3 & 8 \\ & & \underbrace{\quad} & \\ & & \div -1 & \end{array}$$

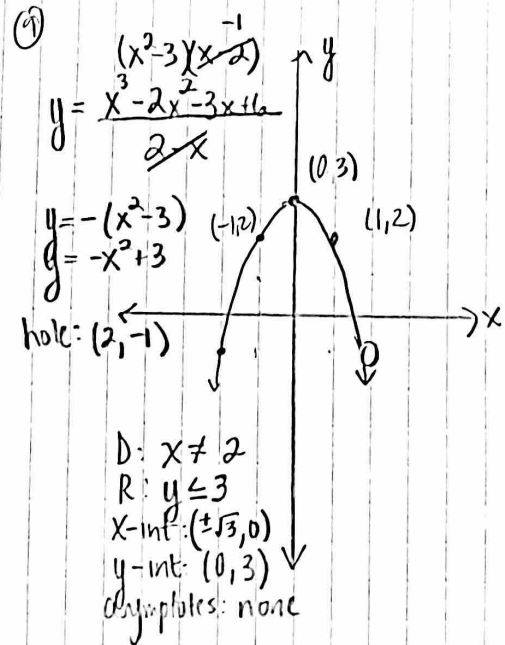
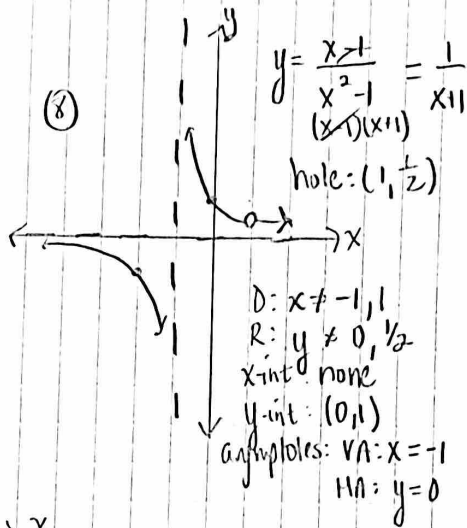
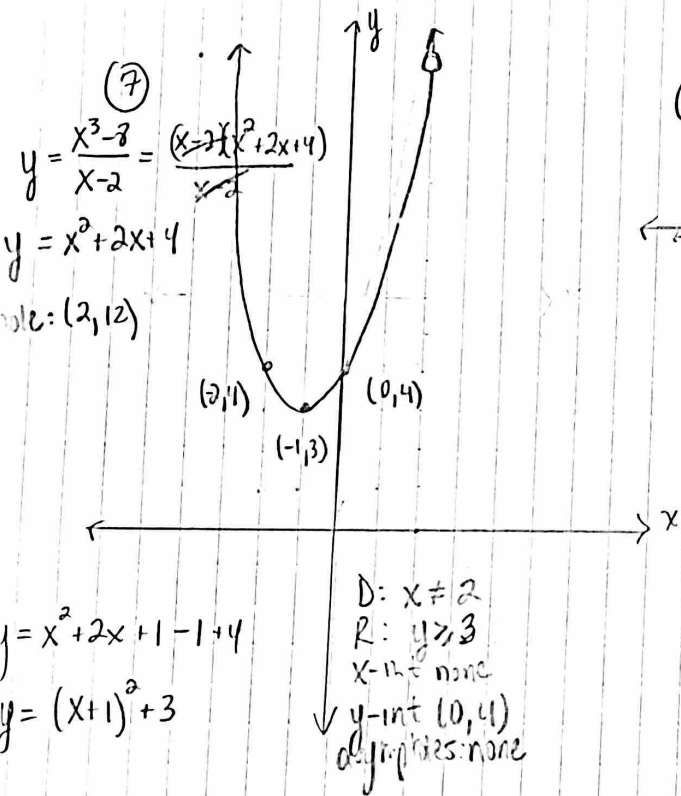
OA: $y = -x - 3$

Homework 12-11

Function	Hole(s)	Vertical Asymptote(s)	Horizontal Asymptote	x-intercept(s)	y-intercept
$y = \frac{4x}{x-3}$	none	$x=3$	$y=4$	$(0,0)$	$(0,0)$
$y = \frac{5x^2}{3+x}$ $x \neq 3$	none	$x=3$	none	$(0,0)$	$(0,0)$
$y = \frac{-4x^2}{(x-2)(x+4)}$	none	$x=2$	$y=-4$	$(0,0)$	$(0,0)$
$y = \frac{\cancel{(x-2)}(x+2)}{\cancel{(x-2)}(x+4)}$ $\frac{-4+x^2}{(x+4)}$	$(2, \frac{2}{3})$	$x=-4$	$y=1$	$(-2,0)$	$(0, \frac{1}{2})$
$y = \frac{3x\cancel{(x-1)}}{2x^2-5x+3}$ $(2x-3)(x-1)$	$(1, 3)$	$x = \frac{3}{2}$	$y = \frac{3}{2}$	$(0,0)$	$(0,0)$
$y = \frac{x}{(x^2-1)(x^2+1)}$	none	$x = \pm 1$	$y=0$	$(0,0)$	$(0,0)$



Reducible Functions Key



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

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

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

$x\text{-int: let } y=0$

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

$$x^2 = 3$$

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

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PC: Vertical, Horizontal and Oblique Asymptotes

Ms. Loughran

Function	Hole(s)	Vertical Asymptote(s)	Horizontal Asymptote	Oblique Asymptote	x-intercept(s)	y-intercept
$y = \frac{x+2}{x^2-16}$ $(x-4)(x+4)$	none	$(x-4)(x+4)=0$ $x = \pm 4$	$y = 0$	none	$\frac{(x+2)}{(x+4)(x-4)} = \frac{0}{1}$ $x+2=0$ $x = -2$ $(-2, 0)$	$y = \frac{0+2}{(0+4)(0-4)}$ $y = \frac{2}{-16}$ $(0, -\frac{1}{8})$
$y = \frac{x^2-16}{x+2}$						
$y = \frac{2x^2}{x^2+4}$						
$y = \frac{2x^2+3x}{x}$						
$y = \frac{3x+21}{9-x}$						
$y = \frac{1}{(x+6)(x-1)}$						