I'll start by showing you the traditional method, but then I'll explain what's really going on and show you how you can do it in your head. It'll be easy!

Given some polynomial guy

$$f(x) = \frac{a\,x^{n} + \ldots}{b\,x^{m} + \ldots}$$

← nth degree polynomial

← mth degree polynomial

1. If $n < m$, then the x-axis is the horizontal asymptote.

2. If $n = m$, then the horizontal asymptote is the line
$$y = \frac{a}{b}$$

3. If $n > m$, then there is no horizontal asymptote. (There is a slant diagonal or oblique asymptote.)

Yeah, yeah, you COULD just memorize these things... but it's way better to KNOW what's going on. Then you can just do it.

Topic/Objective:	Name:
1.4 Composite Functions (aka function composition)	Class/Period: 4
	Date: 10/12/16

Essential Question:

How can I apply the results of one function to another?

Questions:	Notes:
	The composition of the function f with g is written as $f(g(x))$ which is read "f of g of x". or $(f \circ g)(x)$, which is read "f composed with g of x"
	Note: when you "evaluate" a function, you "plug" a number in anywhere the variable is. Then simplify to find the output.
	Ex) Given $f(x) = 2x + 3$ $f(5) = 2(5) + 3$ $= 10 + 3 = 13$
	✻ Function composition means you "plug" one function into the other —
	evaluate $f(x) = 2x + 3$ for $3x - 2$ $f(3x-2) = 2(3x-2) + 3$ input $= 6x - 4 + 3$ $= 6x - 1$ Connection: let $f(x) = 2x + 3$ and $g(x) = 3x - 2$ find $h(x) = (f \circ g)(x)$ $= f(g(x))$

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

input

Questions:	Notes:

Ex) $f(x) = 2x + 3$
$g(x) = x^2 + 4$

find $h(x) = (g \circ f)(x)$
$= g(f(x))$
$= g(2x+3)$
$= (2x+3)^2 + 4$
$= (2x+3)(2x+3) + 4$
$= 4x^2 + 6x + 6x + 9 + 4$
$h(x) = 4x^2 + 12x + 13$

$(a+b)^2$
$= a^2 + b$

You do $f(x) = 5 - 3x$
$g(x) = x^3$

$h(x) = (g \circ f)(x) = (5-3x)^3$

$= (5-3x)(5-3x)(5-3x)$
$(5-3x)(25 - 30x + 9x^2)$

$= 5 \cdot 25 + 5(-30x) + 5(9x^2)$
$-3x(25) - 3x(-30x) - 3x(9x^2)$

$= 125 - 150x + 45x^2 - 75x + 90x^2 - 27x^3$
$= -27x^3 + 135x^2 - 225x + 125$

You can evaluate a composite function for a particular value of x

Ex) $f(x) = 5 - 3x$ $g(x) x^3$
Find $(f \circ g)(3)$
$f(g(3)) = f(27)$
$= 5 - 3(27)$
$= 5 - 81 = -76$

$g(3) = 3^3$
$= 27$

p.15
1 a, e, i, m
p.16 2 b f
3, 5