AGS 3 Name: _____ Period: ____ Date: _____

Notes 1.4

Warmup – Use the product or quotient rule to simplify. Leave answers in exponential form with positive exponents.

1. $3^6 \cdot 3^5$ 3^{11}

2. $10^{-4} \cdot 10^7$ 10^3

3. $p^2 p^5$ p^7

4. $2^6 \cdot 2^{-3} \cdot 2$ 2^4

5. $\frac{7^5}{7^2}$ 7^3

6. $\frac{9^8}{9}$ 9^7

7. $\frac{3^5}{3^8}$ $\frac{1}{3^3}$

8. $\frac{7^{-4}}{7^{-8}}$ 7^4

9. $\frac{p^{-3}}{p^5}$ $\frac{1}{p^8}$

Investigation

With a given function and input determine the inverse function and then explain what it does in words.

a.

Input		The math…		Output
$x = 7$	→	$7 + 8 = 15$	→	7
Original Function				Inverse Function
$f(x) = x + 8$				$f^{-1}(x) =$ $x - 8$

Explain: to undo adding 8 by subtracting 8

b.

Input		The math…		Output
$x = 7$	→	$3 \cdot 7 = 21$	→	7
Original Function				Inverse Function
$f(x) = 3x$				$f^{-1}(x) =$ $\frac{1}{3}x$ or $\frac{x}{3}$

Explain: to undo multiplying by 3, either divide by 3 or multiply by $\frac{1}{3}$

c.

Input		The math…		Output
$x = 7$	→	$7^2 = 49$	→	7
Original Function				Inverse Function
$f(x) = x^2$				$f^{-1}(x) = \sqrt{x}$

Explain: undo a square by taking the square root

d.

Input		The math…		Output
$x = 7$	→	$2^7 = 128$	→	7
Original Function				Inverse Function
$f(x) = 2^x$				$f^{-1}(x) = \log_2 x$

Explain: undo raising to a power by taking the log (bases must be the same)

e.

Input		The math…		Output
$x = 7$	→	$2 \cdot 7 - 5 = 9$	→	7
Original Function		$y = 2x - 5$		Inverse Function
$f(x) = 2x - 5$		$y + 5 = 2x$		$f^{-1}(x) = \frac{x+5}{2}$ or $\frac{1}{2}x + \frac{5}{2}$

Explain: first undo subtracting 5 by adding 5, then undo multiplying by 2 by dividing by 2

f.

Input		The math…		Output
$x = 7$	→	$\frac{7+5}{3} = 4$	→	7
Original Function		$y = \frac{x+5}{3}$		Inverse Function
$f(x) = \frac{x+5}{3}$		$3y = x + 5$		$f^{-1}(x) = 3x - 5$

Explain: first undo dividing by 3 by multiply by 3, then undo adding 5 by subtracting 5

g.

Input		The math…		Output
$x = 7$	→	$(7-3)^2 = 16$	→	7

Original Function	Inverse Function
$f(x) = (x-3)^2$	$f^{-1}(x) = \sqrt{x} + 3$

$y = (x-3)^2$

$\sqrt{y} = x - 3$

Explain: first undo the square by taking the square root, then undo subtracting 3 by adding 3

h.

Input		The math…		Output
$x = 7$	→	$4 - \sqrt{7}$	→	7

Original Function	Inverse Function
$f(x) = 4 - \sqrt{x}$	$f^{-1}(x) = (-y+4)^2$

$y = 4 - \sqrt{x}$

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

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

Explain: first undo adding 4 by subtracting 4, then undo multiplying by -1 by dividing by -1, then square the whole thing to undo the square root

i.

Input		The math…		Output
$x = 7$	→	$2^7 - 10 = 118$	→	7

Original Function	Inverse Function
$f(x) = 2^x - 10$	$f^{-1}(x) = \log_2(x+10)$

$y = 2^x - 10$

$y + 10 = 2^x$

Explain: first undo subtracting 10 by adding 10, then take the log (same base) to undo the exponent.

j. What is the difference between the x used in $f(x)$ and the x used in $f^{-1}(x)$?

x for $f(x)$ is the original input

the x in $f^{-1}(x)$ is the output from $f(x)$

k. Describe the relationship between a function and it's inverse.

- they undo each other
- use inverse operations (order matters!)
- domain must be limited so both the function and its inverse are both functions