AGS 3 Name: _____ Period: _____ Date: _____

Assignment 1.3

The beanstalk in *Jack and the Beanstalk* grew using the model $b(t) = 3^t$ (b in feet and t in hours). Jack (an excellent math student) calculated the following table before he went to bed so he would know how tall it should be when he woke up.

Time (hours)	Height (feet)
1	3
1.5	5.2
2	9
2.5	15.6
3	27
3.5	46.8
4	81
4.5	140.3
5	243
5.5	420.9
6	729
6.5	1,262.7
7	2,187
7.5	3,788
8	6,561
8.5	11,364
9	19,683
9.5	34,092
10	59,049

1. Show how Jack calculated how tall the beanstalk would be after 6 hours.

   $b(6) = 3^6 = 729\ feet$

2. Jack's neighbor, programmed his drone to hover at 243 feet in the air. How long before the beanstalk reached the drone?

   5 hours

3. How long will it take before the beanstalk would interfere with commercial planes that fly between 30,000 and 36,000 feet?

   $\approx 9.5\ hours$

4. If the beanstalk continued to grow, how tall would it be after 15 hours?

   $b(15) = 3^{15} = 14{,}348{,}907\ feet$

5. Use the table to find $f(7)$ and $f^{-1}(11{,}364)$.

   $f(7) = 2187\ \ and\ f^{-1}(11364) = 8.5$

6. Use the table to find $f(9)$ and $f^{-1}(9)$.

   $f(9) = 19.683\ and\ f^{-1}(9) = 2$

7. Which problems could you answer without the table? Any that give time

   Which problems required the table to answer? Any that give height

   Why is the table required to find some answers, but not others? Explain.

   Because, we don't know how to solve for a variable exponent yet.

Refresh Your Memory

Use the given functions to evaluate or simplify for the given input value.

$f(x) = -2x$ $g(x) = 2x + 5$ $h(x) = x^2 + 3x - 10$

8. $f(b^2)$ $f(a+b)$ $f(g(x))$

$f(b^2) = -2b^2$ $f(a+b) = -2a - 2b$ $f\big(g(x)\big) = -4x - 10$

9. $g(b^2)$ $g(a+b)$ $g(h(x))$

$g(b^2) = 2b^2 + 5$ $g(a+b) = 2a + 2b + 5$ $g\big(h(x)\big) = 2x^2 + 6x - 15$

10. $h(b^2)$ $h(a+b)$ $h(f(x))$

$h(b^2) = b^4 + 3b^2 - 10$ $h\big(f(x)\big) = 4x^2 - 6x - 10$

$h(a+b) = a^2 + 2ab + b^2 + 3a + 3b - 10$