AGS 3 Name: _____ Period: ____ Date: _____

Notes 1.3

Warmup – Solve for x.

1. $5^{x+1} = 5^{2x-3}$

$x+1 = 2x-3$

$1 = x-3$

$\boxed{x=4}$

2. $7^{3x-2} = 7^{-2x+8}$

$3x-2 = -2x+8$

$5x-2 = 8$

$5x = 10$

$\boxed{x=2}$

3. $4^{3x} = 2^{2x-8}$

$2^{2(3x)} = 2^{2x-8}$

$6x = 2x-8$

$4x = -8$ $\boxed{x=-2}$

4. $3^{5x-4} = 9^{2x-3}$

$3^{5x-4} = 3^{2(2x-3)}$

$5x-4 = 4x-6$

$x-4 = -6$

$\boxed{x=-2}$

5. $8^{x+1} = 2^{2x+3}$

$2^{3(x+1)} = 2^{2x+3}$

$3x+3 = 2x+3$

$x+3 = 3$

$\boxed{x=0}$

6. $3^{x+1} = \frac{1}{81}$

$3^{x+1} = 3^{-4}$

$x+1 = -4$

$\boxed{x=-5}$

Investigation

You may recall the story of the tortoise and the hare, where the tortoise proclaims that slow and steady wins the race.

The hare (Herbert) is so confident that he can win, he gives the tortoise (Shellie) a 1 meter head start. Including the one meter head start, the model for how far Shelly is from the starting line is given in the following function:

$d(t) = 2^t$ (d in meters and t in seconds)

Shelly's family plans to cheer Shelly on along the way.

a. How far away from the starting line must the family be, to be in the right place, to see Shelly run by 5 seconds after the start of the race? After 10 seconds?

5 seconds?

$d(5) = 2^5$ $\boxed{32 \text{ meters}}$

10 seconds?

$d(10) = 2^{10}$ $\boxed{1024 \text{ meters}}$

b. If the tortoise family plans to watch the race at 64 meters from the starting line, how long would they have to wait for Shelly to run past? How long if they are 1024 meters from the start?

64 meters?

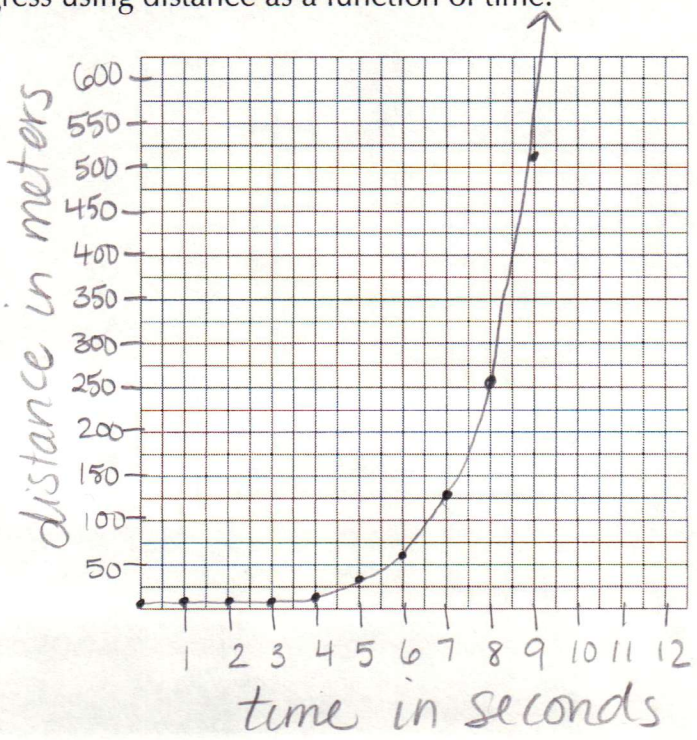
$64 = 2^t$ $\boxed{6 \text{ seconds}}$

1024 meters?

$\boxed{10 \text{ seconds}}$

c. Create a table and graph of Shelly's progress using distance as a function of time.

t	d
0	1
1	2
2	4
3	8
4	16
5	32
6	64
7	128
8	256
9	512

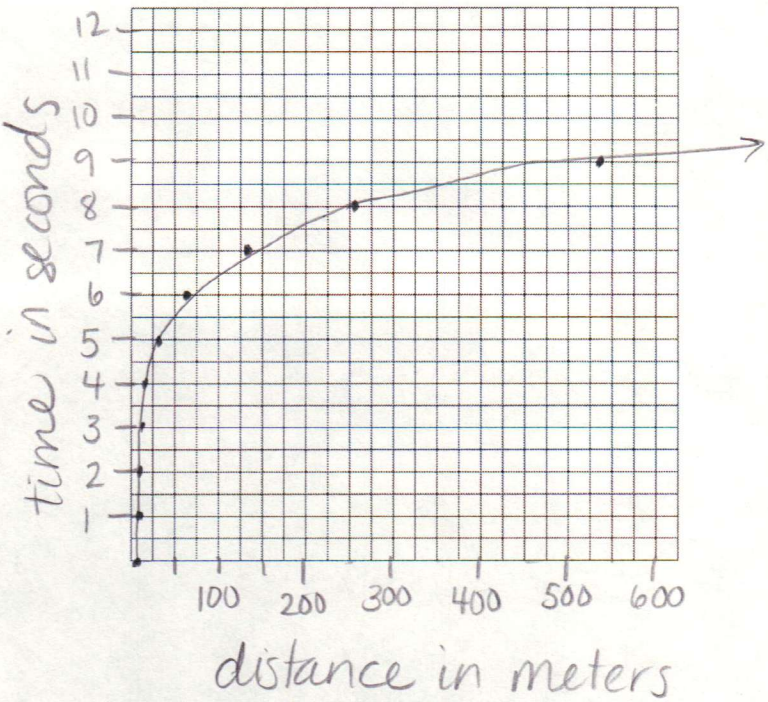


d. Describe the graph of d(t), Shelly's distance at time t. What are the important features of d(t)?

domain $[0, \infty)$ no x intercept exponential
range $[1, \infty)$ (0,1) is y-intercept increasing $(0, \infty)$

e. Create a table and graph of Shelly's progress using time as a function of distance to help her family know how long they will need to wait.

d	t
1	0
2	1
4	2
8	3
16	4
32	5
64	6
128	7
256	8
512	9



f. About how long must Shelly's family wait to see her run past if they are 220 meters from the start?

about $7\frac{3}{4}$ seconds