



Name: _____ Date : _____

IM 3 UNIT 6 TEST V2 - Exponential Functions & Logarithms

Teacher: Mr. Santowski and Ms. Aschenbrenner

Score: _____

PART 1 - CALCULATOR INACTIVE QUESTIONS

1. Solve the following equations, providing EXACT solutions when necessary.

(12 marks)

a. $\log_2\left(\frac{1}{16}\right) = 1 - \frac{x}{2}$

b. $\log_{x+1}\left(\frac{1}{25}\right) = -2$

c. $3(2^{x+1}) - 6 = 12$

d. $(\sqrt{e})^{-x} = e^{\frac{5}{2}x+3}$

2. There are three towns close to the farm where Mr. S grew up back home in Canada. The populations of each town since 1980 are modelled as follows (where t is time in years since 1980):

(13 marks)

Avonmore: $A(t) = 12,000(1.02)^t$	Berwick: $B(t) = \frac{45,000}{1 + 3.5e^{-0.07t}}$	Crysler: $C(t) = 12,000 + 24,000e^{-0.025t}$
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- a. Determine the population of Berwick and Chrysler in 1980.

(i) Berwick in 1980:

(ii) Chrysler in 1980 :

(4M)

- b. At what annual rate are the populations of Avonmore and Chrysler changing?

(i) Avonmore Rate:

(ii) Chrysler Rate:

(2M)

- c. Use your knowledge of “end behaviours” to predict the long term population of each of the three towns.

(3M)

(i) Avonmore:

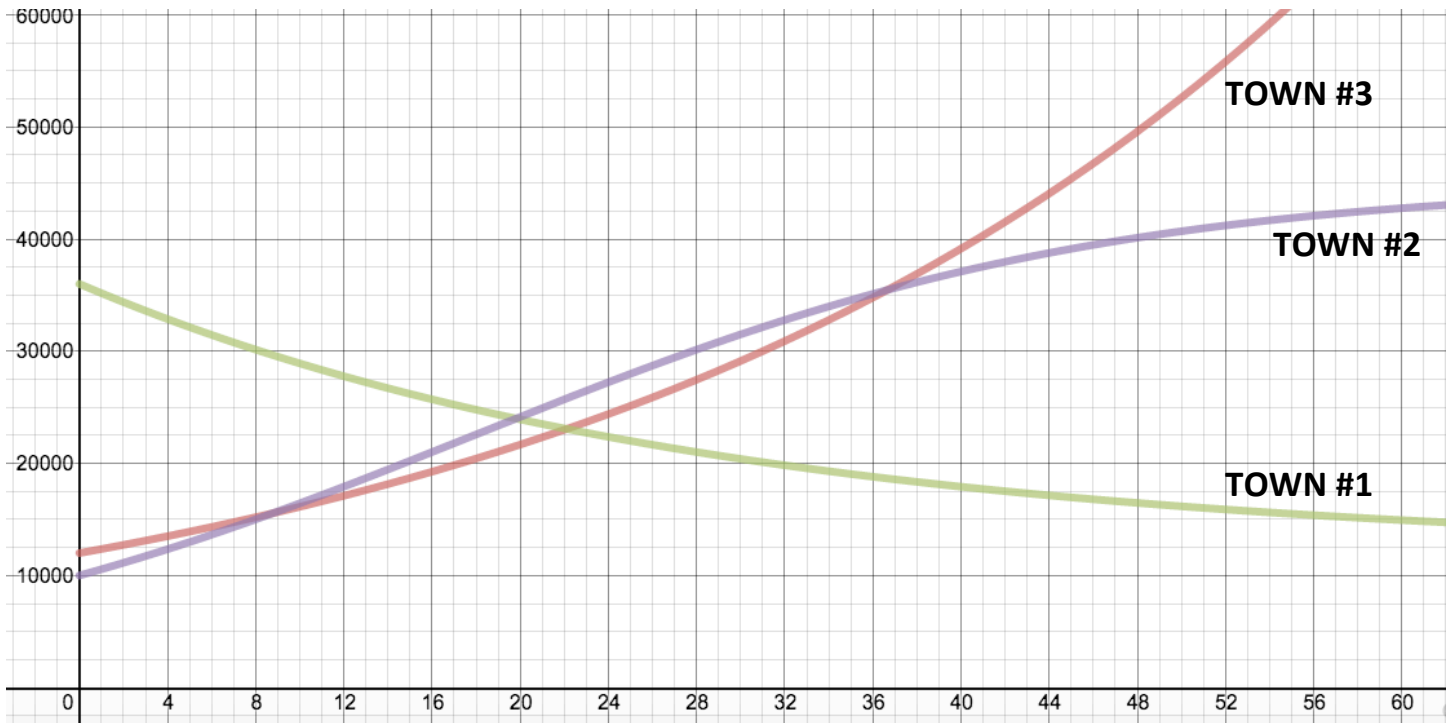
(ii) Berwick:

(iii) Chrysler:

3. There are three towns close to the farm where Mr. S grew up back home in Canada. The population of each town since 1980 are modelled as follows (where t is time in years since 1980):

Avonmore: $A(t) = 12000(1.02)^t$	Berwick: $B(t) = \frac{45000}{1 + 3.5e^{-0.07t}}$	Crysler: $C(t) = 12000 + 24000e^{-0.025t}$
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Now here is a graph of the population of the three towns. Use the graph to answer the following questions:



- a. Use the graph to estimate the year(s) in which the population of Berwick exceeds the population of Avonmore.

(2M)

- b. Use the graph to estimate a solution to the inequality $B(t) > C(t) > A(t)$ and explain what the solution means.

(2M)

4. The IM3 H block class is analyzing the function $f(x) = e^{-x}(x^2 - 1)$. They begin by making PREDICTIONS, without the benefit of a calculator!!

(6 marks)

- a. Marwan is looking for the y-intercept and so he evaluates $f(0)$. Where is the y-intercept? (Show supporting evidence).

(2M)

- b. Andrew is asked to evaluate $f(2)$. He expresses his answer as $f(2) = \frac{3}{e^2}$. Explain/show whether Andrew did this correctly or not.

(2M)

- c. Rafa is looking for the x-intercept(s) of $f(x) = e^{-x}(x^2 - 1)$, so he solves the equation $f(x) = 0$. He gets 2 answers. One answer is $x = 1$. State the other x-intercept. (Show supporting evidence).

(2M)