Homework 5.1 – Exponential Growth and Decay

1. (1 pt) alfredLibrary/AUCI/chapter5/lesson1/quiz-/exponentials2pet.pg

Use the properties of exponents to complete the following.

(a) The expression $\frac{e^x}{e^{8+x}}$ can be written in the form $e^{f(x)}$, where the exponent $f(x)$ is a function of x. Find $f(x)$.

$f(x) =$ _____

(b) The expression $\left(2^{8x}\right)^{4x}$ can be written in the form $2^{g(x)}$, where the exponent $g(x)$ is a function of x. Find $g(x)$.

$g(x) =$ _____

(c) The expression $8^{2x-1}8^{2-4x}$ can be written in the form $8^{h(x)}$, where the exponent $h(x)$ is a function of x. Find $h(x)$.

$h(x) =$ _____

2. (1 pt) alfredLibrary/AUCI/chapter5/lesson1/radioactive1pet.pg

A certain radioactive material decays in such a way that the mass remaining (in grams) after t years is given by the function

$$m(t) = 90e^{-0.03t}$$

(a) The initial mass is _____ grams.

(b) The amount remaining after 40 years is _____ grams.

(c) The decay rate for this material (as a nonnegative percentage) is _____

3. (1 pt) alfredLibrary/AUCI/chapter5/lesson1/poultry2pet.pg

World poultry production was 77.2 million tons in the year 2004 and increasing at a continuous rate of 1.6% per year. Assume that this growth rate continued.

(a) Write an exponential model $P(t)$ for world poultry production in million tons, where t is years since 2004.

$P(t) =$ _____

(b) Use your model to estimate world poultry production in the year 2014.

Production = _____ million tons (Round to the nearest 0.001.)

4. (1 pt) alfredLibrary/AUCI/chapter5/lesson1/asthma1pet.pg

The number of asthma sufferers in the world was about 84 million in 1990 and 130 million in 2001. Let N represent the number of asthma sufferers (in millions) worldwide t years after 1990.

(a) Write N as a linear function of t.
(HINT: You are given two points. Use them to find the slope-intercept equation of the line.)

$N(t) =$ _____ million people.

(b) How many asthma sufferers are predicted worldwide in the year 2014 with the linear model? Round to the nearest 0.01 million people.

_____ million people.

(c) Write N as a discrete exponential function of t of the form $N(t) = A(1+r)^t$.
(HINT: You will need to find $(1+r)$, where r is the rate. Use $N(11) = 130$ and the initial value $N(0) = 84$ to find it.)

$N(t) =$ _____ million people.

(d) How many asthma sufferers are predicted worldwide in the year 2014 with the exponential model? Round to the nearest 0.01 million people.

_____ million people.

5. (1 pt) alfredLibrary/AUCI/chapter5/lesson1/explimit1pet.pg

Compute each of the following limits at infinity. If your answer is ∞ or $-\infty$, then enter 'inf' or '-inf,' respectively. (HINT: First evaluate the limit of the exponent in the exponential function.)

(a) $\lim_{t\to\infty}\left(12e^{-0.1t}+13\right) =$ _____

(b) $\lim_{t\to\infty}\left(14e^{0.45t}-9\right) =$ _____