MATH 117: HW # 5

Instructor: Joseph McGuire

Due: 10/23/2020 11:59pm

Please show your work for the following problems. These problems have solutions that are easily found online, so most of your grade will be based on explaining how we get the solution that we get. You can use a calculator as long as you show the setup of the equation.

1

Express the equations in exponential form and solve for x (Don't need to give a decimal, just a $x =$ something).

1.1

$$\log_x(16) = 4$$

1.2

$$\ln(x - 1) = -1$$

2

Vilfredo Pareto $(1848 - 1923)$ observed that most of the wealth of a country is owned by a few members of the population. **Pareto's Principle** is

$$\log(P) = \log(c) - k\log(W)$$

where W is the wealth level (how much money a person has) and P is the number of people in the population having that much money.

2.1

Solve the equation for P.

2.2

Assume that $k = 2.1$ and $c = 8000$, and that W is measured in billions of dollars. Use part (1.) to find the number of people who have $2 million dollars or more. How many have $10 million or more?

3

Solve the equation

$$2^{2/\log_5(x)} = \frac{1}{16}$$

for x.

4

Newton's Law of Cooling is used in homicide investigations to determine the time of death. The normal body temperature is $98.6^o F$. Immediately following death, the body begins to cool. It has been determined experimentally that the constant in Newton's Law of Cooling is approximately $k = 0.1947$, assuming that time is measured in hours. Suppose that the temperature of the surroundings is $60^o F$.

4.1

Find a function $T(t)$ that models the temperature t hours after death.

4.2

If the temperature of the body is now $72^o F$, how long ago was the time of death?

5

The population of California was 29.76 million in 1990 and 33.87 million in 2000. Assume that the population grows exponentially.

5.1

Find a function that models the population t years after 1990.

5.2

Find the time required for the population to reach 39.51 million. (The current population of California)

5.3

Use the function from part 1 to predict the population of California in the year 2020. How far off is part 2 off from part 3?

6   Extra Credit

Take logarithms to show that the equation

$$x^{1/\log(x)} = 5$$

has no solutions.