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Math 2680 Project 4

Population Growth

I am sure we all at some point during our academic career had said the following words, “Why do we have to learn this topic, it would never benefit me ever in the real world”. The truth of the matter is that in the real world many of the things we learn in school can be used be applied to our everyday lives. This especially applies to Math 2680: Differential Equations. Although differential equations is a heavy based math class, this course has a lot to offer in the real world. After completing differential equations and understand how to solve differential equation problems is when you truly gain a greater aspect of how important learning differential equations can be. A prime example is identifying population growth.

The differential equation describing exponential growth is

|  |  |
| --- | --- |
| (dN)/(dt)=rN. | (1) |

This can be integrated directly

|  |  |
| --- | --- |
| int_(N_0)^N(dN)/N=int_0^trdt | (2) |

to give

|  |  |
| --- | --- |
| ln(N/(N_0))=rt, | (3) |

where N_0=N(t=0). Exponentiating,

|  |  |
| --- | --- |
| N(t)=N_0e^(rt). | (4) |

Equation (1)

dN/dT: is the population after the rate of change

r: the growth rate

N: the population for the given time

To solve for population growth is quite simple when using differential equations. The first equation identifies the population growth in the form of a differential equation.

For example, let’s say the rate of growth(r) is 0.06% annually and the initial population size is 5,000 people. Then the population growth would be 5,000 \* 0.06% equaling to the growth of 3 people annually added to the population.

Although to find the population growth didn’t acquire much use of the aspects of differential equations. To find the initial population value of the given problem, requires a more in-depth use of differentiation equations. To find the initial population value using the first equation, you have to first integrate both sides of the equation giving you ln(N/N(o)) =rt. After solving for N, you get , which is the equation for the initial population value.

A more in-depth explanation can be found here:

<https://www.khanacademy.org/math/ap-calculus-ab/ab-differential-equations-new/ab-7-8/v/modeling-population-with-simple-differential-equation>

References:

“Differential Equations in Real Life.” *IB Maths Resources from British International School Phuket*, 30 Nov. 2020, ibmathsresources.com/2014/02/28/differential-equations-in-real-life/.

“Population Growth.” *From Wolfram MathWorld*, mathworld.wolfram.com/PopulationGrowth.html.