MATH 5071 - Problem Set 7

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1) Solve for x:

i) $\log_8(4x-3) = \log_8(33)$

ii) $\log_4(x+2) = 2$

iii) $4^x = 0.4$

iv) $4.6 \cdot 10^x = 7$

v) $9(4.5)^x = 10$

2) A particular satellite has a radio-isotope power supply. with power output given by $P = 60e^{-\frac{t}{300}}$. where t is the time (in days) and P is the power output (in Watts).

i) What is the power output at the end of the isotope's first year?

ii) When the power output drops below 6 Watts, there will be insufficient power to operate the satellite. Find how long the satellite will remain operable.

3) If money is invested at 6% interest compounded continuously, how long will it take for the money to double in value?

4) Strontium-90 has a half-life of 25 years. How long will it take 10 grams on Strontium-90 to decay to 3 grams?

5) The population of Iceland in 2008 was about 304,000, with an annual growth rate of 0.78%. Assume the growth rate is constant.

i) Give an equation for the population of Iceland n years after 2008.

ii) Predict the population in 2020.

iii) Predict when the population will reach 400,000.

6) Solve the following inequalities. Give both inequality, interval notation, and number line forms of the solutions.

i) $-2(x-3) < 5(x+1) - 12$

ii) $-14 < -7(3x+2) \leq 1$

iii) $x^2 - 10 \leq 3x$

iv) $x^4 + 4x^3 - 12x^2 \leq 0$

v) $\frac{3x+1}{x+4} > 1$

vi) $\frac{x-8}{x} > 3 - x$

7) Find the quadratic equation the passes through the points (2,37), (5,10), and (9,2) by solving a system of equations. Use matrix multiplication to check your answers.