

MATH 117: HW # 4

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Due: 10/09/2020 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

Use the rules of exponents to show: If $f(x) = 10^x$, show that

$$\frac{f(x+h) - f(x)}{h} = 10^x \left(\frac{10^h - 1}{h} \right).$$

2

Use the rules of exponents to show: If $f(x) = 3^{x-1}$, show that

$$\frac{f(x+h) - f(x)}{h} = 3^{x-1} \left(\frac{3^h - 1}{h} \right).$$

3

Use the compound interest formula to find the present value of \$10,000 if interest is paid at a rate of 8% per year, compounded monthly, for 5 years.

4

Animal populations aren't capable of unrestricted growth because of limited habitat and food supplies. Under such conditions the population follows *logistic growth model*:

$$P(t) = \frac{d}{1 + ke^{-ct}}$$

where c, d, k are all positive constants. For a certain fish population in a small pond $d = 1000$, $k = 10$, $c = 0.1$ and t is measured in years. The fish were

introduced into the pond at time $t = 0$. Fill in the populations at the given times:

P(t)	t
	0
	1
	10
	100

Feel free to use a calculator, just show me the setup of the equation.

5

What's the end behavior of $P(t)$ from (4.) as $t \rightarrow \infty$ (gets really big)? Explain why.