BECA / Huson / Algebra 2: Exponentials Jan 2023 Regents Name:
18 April 2024

Regents problems: Exponential functions

1. The value of an automobile t years after it was purchased is given by the function $V = 38,000(0.84)^t$. Which statement is true?
   (a) The value of the car increases 84% each year.
   (b) The value of the car decreases 84% each year.
   (c) The value of the car increases 16% each year.
   (d) The value of the car decreases 16% each year.

2. Which function represents exponential decay?
   (a) $p(x) = \left(\frac{1}{4}\right)^x$
   (b) $q(x) = 1.8^{-x}$
   (c) $r(x) = 2.3^{2x}$
   (d) $s(x) = 4^{\frac{x}{2}}$

3. Mia has a student loan that is in deferment, meaning that she does not need to make payments right now. The balance of her loan account during her deferment can be represented by the function $f(x) = 35,000(1.0325)^x$, where x is the number of years since the deferment began. If the bank decides to calculate her balance showing a monthly growth rate, an approximately equivalent function would be
   (a) $f(x) = 35,000(1.0027)^{12x}$
   (b) $f(x) = 35,000(1.0027)^{\frac{x}{12}}$
   (c) $f(x) = 35,000(1.0325)^{12x}$
   (d) $f(x) = 35,000(1.0325)^{\frac{x}{12}}$

4. To the *nearest tenth*, the solution to the equation $4300e^{0.07x} - 123 = 5000$ is
   (a) 1.1
   (b) 2.5
   (c) 6.3
   (d) 68.5

5. For which approximate value(s) of x will $\log(x+5) = |x-1| - 3$?

   (a) $5, 1$

   (b) $-2.41, 0.41$

   (c) $-2.41, 5$

   (d) 5, only

6. What is the solution of $2(3^{x+4}) = 56$?

   (a) $x = \log_3(28) - 4$

   (b) $x = -1$

   (c) $x = \log(25) - 4$

   (d) $x = \dfrac{\log(56)}{\log(6)} - 4$

7. Consider the data in the table below.

x	1	2	3	4	5	6
y	3.9	6	11	18.1	28	40.3

   State an exponential regression equation to model these data, rounding all values to the *nearest thousandth*.

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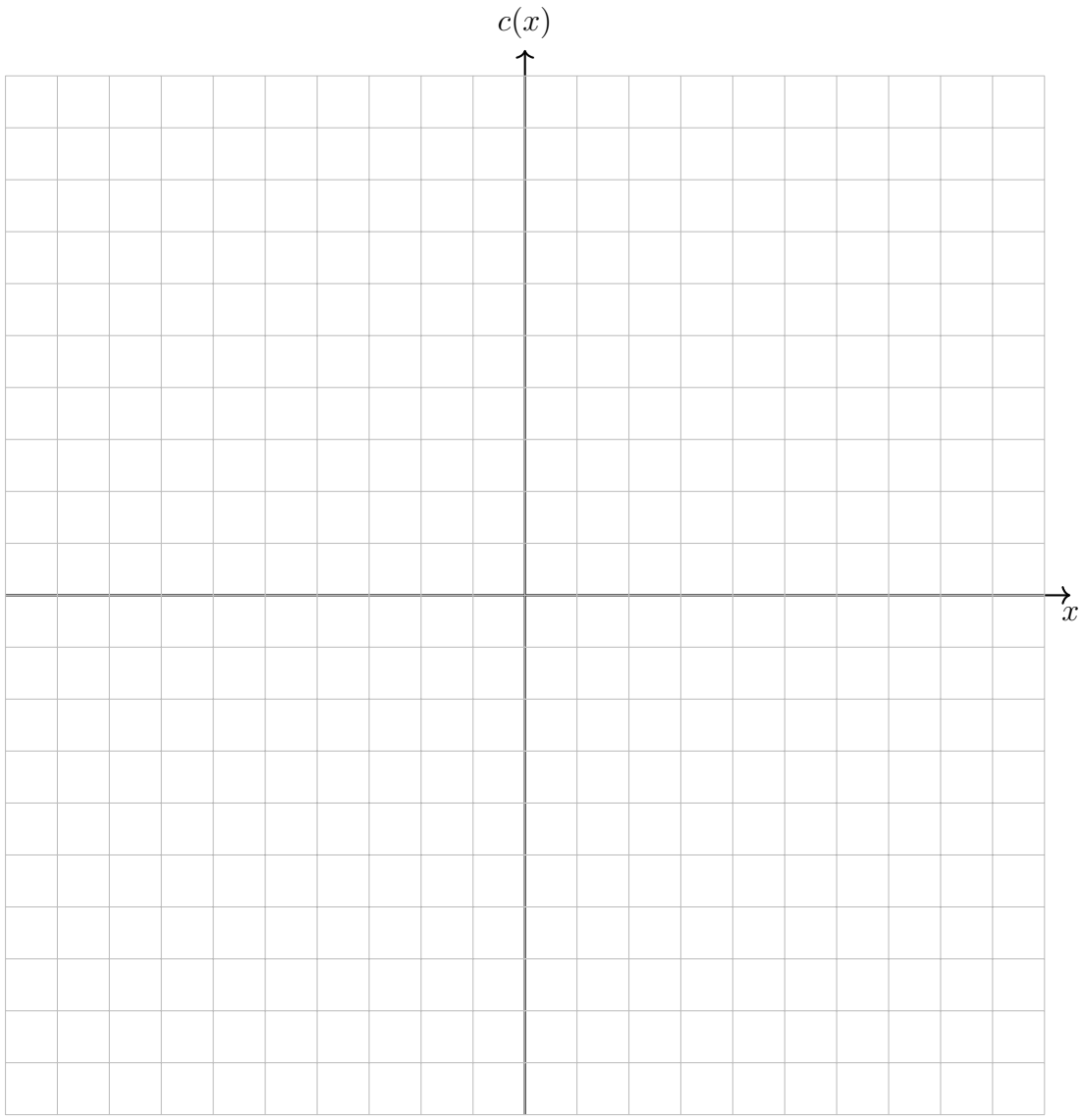
8. Graph $c(x) = -9(3)^{x-4} + 2$ on the axes below.



Describe the end behavior of $c(x)$ as x approaches positive infinity.

Describe the end behavior of $c(x)$ as x approaches negative infinity.

9. Objects cool at different rates based on the formula below.

$T = (T_0 - T_R)e^{-rt} + T_R$

T_0 : initial temperature

T_R : room temperature

r : rate of cooling of the object

t : time in minutes that the object cools to a temperature, T

Mark makes T-shirts using a hot press to transfer designs to the shirts. He removes a shirt from a press that heats the shirt to 400°F. The rate of cooling for the shirt is 0.0735 and the room temperature is 75°F. Using this information, write an equation for the temperature of the shirt, T, after t minutes.

Use the equation to find the temperature of the shirt, to the nearest degree, after five minutes.

At the same time, Mark's friend Jeanine removes a hoodie from a press that heats the hoodie to 450°F. After eight minutes, the hoodie measured 270°F. The room temperature is still 75°F. Determine the rate of cooling of the hoodie, to the *nearest ten thousandth.*

The T-shirt and hoodie were removed at the same time. Determine when the temperature will be the same, to the nearest minute