

# Jan 2016 Exponential Functions QUIZ

Name \_\_\_\_\_

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Show the key steps in your solutions. Write equations & show substitutions

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1. The value of Mr. S's house is decreasing at a rate of 4% per year. He first bought the house in January of 1996 and he paid \$350,000 for the house. **(Total 8 marks)**
  - a. The model that Mr. S writes for this problem is  $y = 350000(0.96)^x$ . Explain why he uses the base of 0.96 in this equation. **(2M)**
  - b. What is the value of the house today (in the year 2016)? Show the key steps of your solution. **(3M)**
  - c. When was the value of the house \$250,000. Show the key steps of your solution. Give your answer, rounded to one decimal place. Include a sketch from your calculator. **(3M)**

2. The cost of rice in Egypt can be modeled by the exponential equation  $y = 5.40(1.125)^x$ , where  $y$  represents the cost of 1 kg of white rice in Egyptian pounds and  $x$  represents the number of years since January 1<sup>st</sup> of 2010.

**(Total 14 marks)**

- a. The number 5.40 appears in the equation. What does the 5.40 represent? **(2M)**
- b. What does the point (5, 9.73) mean in the context of this problem? **(2M)**
- c. At what rate (percent) is the price of rice increasing? **(1M)**
- d. What would be the price of rice in 2020? **(3M)**
- e. In what year does the price of rice first exceed 30 LE/kg? Explain how you determined your answer. **(3M)**
- f. How long does it take for the price of rice to reach 60 LE/kg? Give an EXACT answer, rounded to one decimal place. Explain how you determined your answer. **(3M)**
- g. BLACK LEVEL Q. A family typically budgets about 3000 LE for purchasing rice. If the amount being budgeted for rice by the family increases at a rate of 5% per year, how much less rice can the family buy in 2016, compared to 2010?

3. Mr. Smith and Mr. Santowski are discussing their retirement investments. Mr. Smith says that he invested \$25,000 when he turned 30 years old and that the value of this investment has been increasing at a rate of 6.5% every year. **(Total 11 marks)**
- a. Mr. Smith would like to retire when he is 60 years old, but he needs to have \$200,000 in this investment. Is this possible? Explain why/why not. **(2M)**
- b. What is the value of the investment when Mr. Smith is 40 years old? Show the key steps of your solution. **(3M)**
- c. How many years does it take for the investment to triple in value? Show the key steps of your solution. **(3M)**

After Mr. Smith and Mr. Santowski had their discussion, Mr. Santowski decides to start investing for his retirement as well. So Mr. Santowski was 50 years old when he first started the investment and would like to retire when he is 65 years old (so 15 years later).

- d. How much money should Mr. Santowski invest ***at the beginning*** in order to have \$200,000 when he turns 65 and retires? Show the key steps of your solution. **(3M)**
- e. BLACK LEVEL Q? Of course, Mr. Santowski does not have that much money. So he decides to invest the \$40,000 he currently has (at the age of 50 years old), invests it for 15 years and wants the value of the investment to be \$200,000. What should the annual rate of growth of the investment be?