Problem Set 5.2

1.) Instead of making a down payment on a house, a couple that lives in an apartment decides to invest $50,000 that they inherited from Aunt Zelda into a real estate fund that earns 6.3% interest, compounded annually. Let A be the value of the fund after t years.

    a) Write A as a function of t.

    b) What will the value of the investment be after 10 years? 20 years?

    c) Graph the function you wrote in (a) for years 0 through 20. Label the coordinates of the y-intercept and indicate all asymptotes with a dashed line.

    d) Redo part (b), but use quarterly compounding instead of annual.

2.) A couple has a baby and they want to put money in a college savings plan that assures them 7% interest for the next 18 years. If the parents want to have $125,000 when their child starts college, how much do they need to put in this college savings program now? *Note: For this problem and the rest of the course, if no mention is made of the type of growth (annually, compounded quarterly, continuously, etc) assume annually compounded growth.*

3.) Redo (2), but assume the interest is compounded continuously.

4.) According to the CIA World Factbook, the population of Western Sahara is growing at a rate of 2.7%. Its current population is 605,253 people.

   a) What will the population of Western Sahara be in one year?

   b) What was the population one year before the most current estimate?

   c) Express the population P as a function of n, the number of years from now.

5.) Fungus is growing exponentially in a Petri dish in a circular pattern according to the function $f(x) = a(b)^x$, where a is the initial area, b is the growth factor and $f(x)$ is the area after x hours. Two hours after the start of the experiment the area of the fungus was 5 mm^2. After 4 hours the area was 17 mm^2.

a) Give a function for the area in terms of time since the start of the experiment.

b) What was the area 7 hours after the start of the experiment?

6.) According to the PEW Research Center, the portion of the US population that identifies themselves as Christian declined about 7% from 2007 to 2014. At this rate, how many years will it take until the number of those who identify as Christians is half of what is was in 2007? *Hint – you don't need to know the exact population in 2007 to answer this question*

Source: "America's Changing Religious Landscape." Religion and Public Life. PEW Research Center, n.d. Web 16 June 2015

7.) The Smithsonian Book of North American Mammals reports that, "Steller sea lion population numbers have declined by more than 90 percent in the last 20 years in most of Alaska and Southern California." If the population declined by the same percent each of those 20 years, by what percent did it decline each year? (Assume that the population declined by exactly 90%.)

Source: "The Smithsonian Book of North American Mammals (Natural History). P.199, Vancouver: Univ of British Columbia Pr, 2003.

8.) If you buy a car for $29,873 and after one year with typical driving distances it is only worth about $27,314, what will the car be worth after 5 years (from its original purchase) if it continues to depreciate at the same rate?

9.) Find the exponential function $f(x) = a(b)^x$ such that $f(3) = 2$ and $f(5) = 32$.

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10) How could I evaluate the following expressions without a calculator? (Review) Use your calculator to evaluate if you cannot remember, but reflect on how you could do it without a calculator.

a) $100^{\frac{1}{2}}$ b) $100^{-\frac{1}{2}}$ c) $16^{\frac{3}{2}}$ d) $27^{-\frac{4}{3}}$