LT: 5A

1. Given $y = 2 + 5\left(\frac{2}{3}\right)^{-3x-9}$

State the following

a.) Parent function, any
b.) Vertical/Horizontal shift
c.) Vertical Stretch or Compression

1. We need to get the exponential function into the form $y = a(b)^{x-h} + k$

$$y = 5\left(\frac{2}{3}\right)^{-3(x+3)} + 2$$

$$y = 5\left(\left(\frac{2}{3}\right)^{-3}\right)^{(x+3)} + 2 = 5\left(\left(\frac{3}{2}\right)^{3}\right)^{(x+3)} + 2$$

$$y = 5\left(\frac{27}{8}\right)^{(x+3)} + 2$$

The general form for a exponential function $y = a(b)^{x-h} + k$

a.) Parent Function then is $y = (b)^x$ so $y = \left(\frac{27}{8}\right)^x$ there can be no coefficient in front of x. That is why we factored out a -3 from the exponent.

b.) Vertical Shift (k) is 2 units up and Horizontal Shift (h) is 3 units left

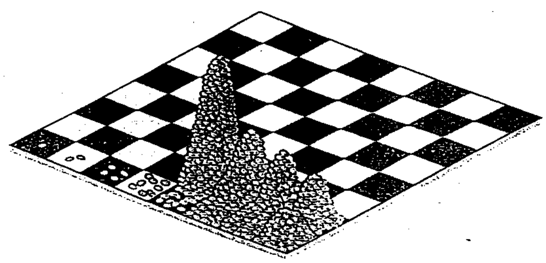
c.) Since "a" (in this case the number 5) is greater than 1 then it is a stretch of the parent graph.

LT: 5C

1. For the following problem,

a.) Create a sequence formula to model the number of rice grains on the “nth” square.
b.) Find out how much rice is on the 27th square.
c.) Answer the question that is stated in the problem.

Grains of Wheat on a Chess Board In an old fable, a commoner who had just saved the king’s life was told he could ask the king for any just reward. Being a shrewd man, the commoner said, “A simple wish, sire. Place one grain of wheat on the first square of a chessboard, two grains on the second square, four grains on the third square, continuing until you have filled the board. This is all I seek.” Compute the total number of grains needed to do this to see why the request, seemingly simple, could not be granted. (A chessboard consists of $8 \times 8 = 64$ squares.)



a.) Approach: Write out the sequence 1, 2, 4, 8, 64, … we notice the pattern is geometric in nature so we can state the pattern being of the form $a_n = a_1 r^{n-1}$ so $a_n = 1(2)^{n-1}$.

b.) On the 27th square we use n = 27 in $a_n = 1(2)^{n-1}$ and we get 67,108,864 grains of rice!

c.) Total use geometric sum formula to compute the series.

$S_n = \frac{a_1 - a_1 r^n}{1-r} \rightarrow S_{64} = \frac{1-1(2)^{64}}{1-2} \approx 1.844 \bullet 10^{19}$ which is a really huge number almost 2 with 19 zeros after it!

LT 5B

1. Compute $\sum_{k=4}^{11} 2(5)^{k-2}$

1. Plug in $k=4$ into $2(5)^{k-2}$ to get $a_1 = 50$
   Plug in $k=5$ into $2(5)^{k-2}$ to get $a_2 = 250$
   Plug in $k=6$ into $2(5)^{k-2}$ to get $a_3 = 1250$

The pattern is geometric with a common ratio, $r=5$, $a_1 = 50$, $n = 11-4+1 = 8$

Since $\sum$ means S_n we are looking for $S_8 = \dfrac{50-50(5)^8}{1-5} = 4{,}882{,}800$

2. If the series is geometric $a_4 = 108$ and $a_3 = 36$ what is sum of the series, $S_8 = ?$

2. Approach find r using a_4 and a_3, $a_4 = a_3 \bullet r \rightarrow \dfrac{a_4}{a_3} = r \therefore r = \dfrac{108}{36} = 3$

Then using r work back to $\dfrac{a_3}{r} = a_2 \rightarrow \dfrac{a_2}{r} = a_1 = 4$

The using the geometric sum formula we get

$$S_8 = \frac{4-4(3)^8}{1-3} = 13{,}120$$

Know this for Retest on LT 5B and LT 5C

If a bank gives 1.2% interest, calculate the following if you put $1500 into the account at the beginning of the year. Write down the equation you are going to use, show work, and briefly explain your answer for full credit.

a. Total money in the account after 8 years if no money was taken out.

b. Total money in the account after 8 years if the money was compounded weekly and if no money was taken out.

c. Total money in the account after 8 years if the money was compounded continuously and if no money was taken out.

a.
$$CurrentValue = InitialValue(1+rate)^{time}$$
$$CurrentValue = 1500(1+0.012)^{8} = 1650.19535$$

b.
$$CompoundInterest$$
$$CurrentValue = InitialValue\left(1+\frac{rate}{n}\right)^{time\bullet n}$$
$$CurrentValue = 1500\left(1+\frac{0.012}{52}\right)^{8\bullet 52} = 1651.120309$$

n = number times it is compounded each year, there is 52 weeks in a year.

c. Continual Compound Interest.

$$CurrentValue = InitialValue \bullet e^{rt}$$
$$CurrentValue = 1500e^{0.012\bullet 8} = 1651.138596$$