**Practice Questions from HW 17-18 (Section 10.1-10.3) to prepare for Quiz 6.**
***Note: The actual quiz will be shorter.***

**1.** Complete: $\sum_{k=0}^{\infty} 400(1.10)^k = \boxed{\phantom{xx}}$ Write in the box an exact number or DNE or $\infty$ or $-\infty$.

**2.** Complete: $\sum_{k=0}^{\infty} \frac{282}{13^{k-1}} = \boxed{\phantom{xx}}$ Write in the box an exact number or DNE or $\infty$ or $-\infty$.

If $\sum_{k=0}^{\infty} \frac{282}{13^{k-1}}$ were written as $\sum_{k=0}^{\infty} ar^k$, report $a$ and $r$. $a =$ _______, $r =$ _________.

**3.** The series $\sum_{k=0}^{\infty} ar^k$ converges to 5. If $a = 9.5$, what is the value of $r$? Complete: $\sum_{k=0}^{\infty} 9.5\left(\boxed{\phantom{xx}}\right)^k = 5$

Show work.

**4.** The series $\sum_{k=0}^{\infty} ar^k$ converges to 5. If $r = \frac{1}{25}$, what is the value of $a$? Complete: $\sum_{k=0}^{\infty} \boxed{\phantom{xx}}\left(\frac{1}{25}\right)^k = 5$

Show work.

**5.** For what values of $r$ does the series $\sum_{k=0}^{\infty} a(r)^k$ converge? ______________________

**6.** Consider the function $f(x) = \sum_{k=0}^{\infty} 9\left(\frac{x-4}{2}\right)^k$

**a.** Evaluate $f(3)$. Show work. $f(3) = \boxed{\phantom{xx}}$ Write in the box an exact number or DNE or $\infty$ or $-\infty$.

**b.** For what values of $x$ does $f(x)$ converge? Show work.

$\boxed{\phantom{xx}} < x < \boxed{\phantom{xx}}$

**7.** Complete: $\frac{2 \cdot 124}{125} + \frac{2 \cdot 124^2}{125^2} + \frac{2 \cdot 124^3}{125^3} + \ldots = \boxed{\phantom{xx}}$ Write in the box an exact number or DNE or $\infty$ or $-\infty$.

**8.** Consider the sequence given by the recurrence relation $a_{n+1} = 0.95a_n + 8.2, \quad a_1 = 8.2$

**a.** The sequence converges to a limit $L$. Give the exact value of $L$. $L =$ ☐

**b.** Convergence occurs when $a_{n+1} = a_n$. Use this fact to rewrite the above recurrence relation into an equation that involves $L$.

Equation: ______________________________________

**c.** ***Solve*** the equation in part **b** to justify your claim in part **a**.

**d.** Complete the boxes below to write the next two terms of the series in long form.
Each subsequent term involves a numerical expression containing 0.95 and 8.2.

8.2 + ☐ + ☐ + …

**c.** Without using sigma notation, write an expression that gives the $n$th partial sum of this series $S_n =$ $\dfrac{\square\left(1-\square^{\square}\right)}{\square}$
i.e., the sum of the series of $n$ terms.

**d.** Enter your expression from part **e** in your grapher and scroll a table to find the value of $n$ for which the sum first surpasses 150.

The number of terms $n =$ ☐

**9.** Once per year Richie Rich deposits an amount of $400 in an account which pays 10% interest per year, compounded annually, with **<u>additional deposits of $400 continually made at the end of the year</u>**.

If $B_n$ is the balance in the account, in dollars, immediately after Richie makes the $n$th deposit, then we can write $B_1 = \$400$.

**a.** Complete the table to find the following. Report to the nearest $0.01.

**i)** the balance, $B_2$, of the account on the day immediately after the second deposit.
**ii)** the balance, $B_3$, of the account on the day immediately after the third deposit.
**iii)** the balance, $B_4$, of the account on the day immediately after the fourth deposit.

| $n$, # Deposits | $B_n$ |
|---|---|
| 1 | $400 |
| 2 | |
| 3 | |
| 4 | |

**b.** Suppose Richie makes 422 deposits. Which is true about the sum $B_{422}$?
The balance, $B_{422}$, of the account on the day immediately after the 422nd deposit is exactly

A. $B_{422} = 400 \cdot 10^{422} + 400 \cdot 10^{421} + ... + 400 \cdot 10^2 + 400 \cdot 10 + 400$

B. $B_{422} = 400 \cdot 1.10^{423} + 400 \cdot 1.10^{422} + ... + 400 \cdot 1.10^2 + 400 \cdot 1.10 + 400$

C. $B_{422} = 400 \cdot 10^{423} + 400 \cdot 10^{422} + ... + 400 \cdot 10^2 + 400 \cdot 10 + 400$

D. $B_{422} = 400 \cdot 1.10^{422} + 400 \cdot 1.10^{421} + ... + 400 \cdot 1.10^2 + 400 \cdot 1.10 + 400$

E. $B_{422} = 400 \cdot 1.10^{421} + 400 \cdot 1.10^{420} + ... + 400 \cdot 1.10^2 + 400 \cdot 1.10 + 400$

F. $B_{422} = 400 \cdot 10^{421} + 400 \cdot 10^{420} + ... + 400 \cdot 10^2 + 400 \cdot 10 + 400$

**c.** The balance, $B_{422}$, of the account on the day immediately after the 422nd deposit is approximately

A. $B_{422} \approx \$1291712354137103000000$

B. $B_{422} \approx \$1067530871187688000000$

C. $B_{422} \approx \$1174283958306457000000$

D. $B_{422} \approx \$1188774622351958700000$

E. $B_{422} \approx \$144906640455016800000$

F. The value of $B_{422}$ can not be computed.

**10.** Consider the function $f(x)=\sum_{k=1}^{\infty}100\left(\frac{-x}{10}\right)^{k+1}$

**a.** Write out the first four terms: $f(x)=\sum_{k=1}^{\infty}100\left(\frac{-x}{10}\right)^{k+1} = \square + \square + \square + \square + \ldots$

**b.** Evaluate: $f(0)=\square$ Write in the box an exact number or DNE or ∞ or −∞.

**c.** Evaluate: $f(10)=\square$ Write in the box an exact number or DNE or ∞ or −∞.

**d.** Evaluate: $f(20)=\square$ Write in the box an exact number or DNE or ∞ or −∞.

**e.** For what values of *x* does *f*(*x*) converge? Show work.

$\square < x < \square$

**f.** Find the sum, assuming *x* is in the interval in part **e**. Simplify.

$$f(x)=\sum_{k=1}^{\infty}100\left(\frac{-x}{10}\right)^{k+1} = \square$$

**11.** Complete the boxes and evaluate each of the following series. If it diverges to ∞, then insert ∞ in the answer box.

a. $f(x)=\sum_{k=0}^{\infty}\frac{1380}{5^{2-k}}=55.2+276+1380+6900+\ldots$

**i.** $a=\square$ $r=\square$

**ii.** $f(x)=\sum_{k=0}^{\infty}\frac{1380}{5^{2-k}}=55.2+276+1380+6900+\ldots=\square$

**iii.** Give a reason for your claim in part **ii**. that does not have anything to do with technology.

______________________________________________

b. $f(x)=\sum_{k=0}^{\infty}\frac{1380}{5^{k-2}}=34500+6900+1380+276+55.2+\ldots$

**i.** $a=\square$ $r=\square$

**ii.** $f(x)=\sum_{k=0}^{\infty}\frac{1380}{5^{k-2}}=34500+6900+1380+276+55.2+\ldots=\square$

**iii.** Give a reason for your claim in part **ii**. that does not have anything to do with technology.

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**12.** Consider the function $f(x)=\sum_{k=1}^{\infty} e^{-kx}$

**a.** Write out the first four terms, exactly: $f(x)=\sum_{k=1}^{\infty} e^{-kx} = \square + \square + \square + \square + \ldots$

**b.** Evaluate: $f(0)= \square$ Write in the box, an exact number or DNE or $\infty$ or $-\infty$.

**c.** Evaluate: $f(6)= \square$ Write in the box, an exact number or DNE or $\infty$ or $-\infty$.

**d.** For what values of $x$ does $f(x)$ converge? Show work.

$\square < x < \square$

**e.** Find the exact sum, assuming $x$ is in the interval in part **d**. $f(x)=\sum_{k=1}^{\infty} e^{-kx} = \square$

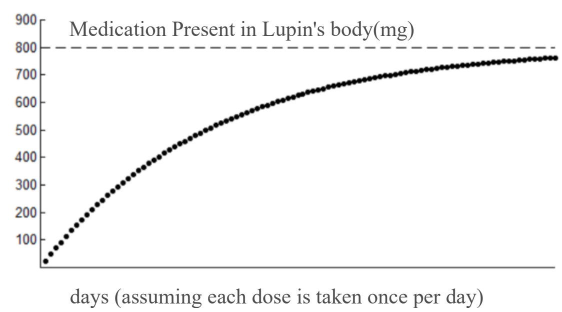
**13.** Professor Snape needs to create a potion for Remus Lupin to address the negative effects of his lycanthropy. Unfortunately, this medication takes a very long time to stabilize. Snape wants the stabilization level to eventually be 800 mg. For this to happen, Lupin must take the potion once per day in perpetuity. Lupin's body will eliminate only 3% of the medication between each dose. Answer the questions below.

**a.** What dosage should Professor Snape prescribe so that the drug stabilization level will be 800 mg?

Lupin must take $\square$ mg each day. Show your calculations.

**b.** Create a formula which gives the amount of medication that is present, in mg, in Lupin's body right after the $x$th dose of the amount prescribed in part **a.** $A(x)= \square$

**c.** To the right is a graph of the formula in part **b**.




The drug will take effect when the medication level in Lupin's body is first within 730 mg. How many days of regular doses will it take for the drug to take effect? It will take $\square$ days to reach a level of 730 mg, assuming Lupin takes one dose every day as prescribed. No work need be shown. Utilize your technology.

**14.** Find the exact value of $k$ for which $e^k + e^{2k} + e^{3k} + e^{4k} + \ldots = 99$

**15.** For what values of $r$ does $a_n = r^n$ converge? For what values of $r$ does $a_n = r^n$ diverge?

**16.** Write in the box an **exact** number or DNE or $\infty$ or $-\infty$. Then report if the sequence $a_n$ converges or diverges.

**a.** If $a_n = \left(\dfrac{n-\ln 5003}{n}\right)^n$, then $\lim_{n\to\infty} a_n = \square$. The sequence ____________________.
{converges, diverges}

**b.** If $a_n = \sqrt{5003\tan^{-1} n}$, then $\lim_{n\to\infty} a_n = \square$. The sequence ____________________.
{converges, diverges}

**c.** If $a_n = \dfrac{71-\sqrt{22x}}{\sqrt{x}}$, then $\lim_{n\to\infty} a_n = \square$. The sequence ____________________.
{converges, diverges}

**d.** If $a_n = \dfrac{\sqrt{22x}-71x}{\sqrt{x}}$, then $\lim_{n\to\infty} a_n = \square$. The sequence ____________________.
{converges, diverges}