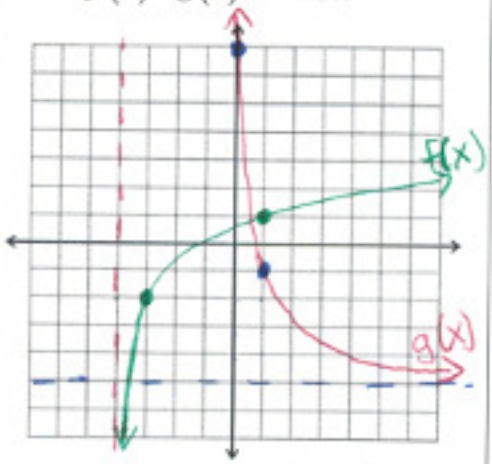
**Unit 3 Test Review 3** Name: Period:

1) Graph $f(x)=3\log_5(x+4)-2$ and $g(x)=12(3)^{-x}-5$ on the same axes and then find the approximate value that makes $f(x)-g(x)=0$ true.




$f(x)-g(x)=0$ is where they intersect. $\boxed{x=.6}$

2) Solve: $2\left(\frac{1}{8}\right)^x+6<26$

$-6 \quad -6$

$2\left(\frac{1}{8}\right)^x<32$

$\frac{2}{2}$

$\left(\frac{1}{8}\right)^x<16$

$(2^{-3})^x<2^4$

$2^{-3x}<2^4$

$-3x<4$

$\frac{-3}{-3}$ $\frac{4}{-3}$

$\boxed{x>-\frac{4}{3}}$

3) Complete the proof for the geometric series formula:

$S_n=a+ar+ar^2+ar^3+\ldots+ar^{n-1}$

$rS_n=ar^1+ar^2+ar^3+\ldots+ar^{n-1}+ar^n$

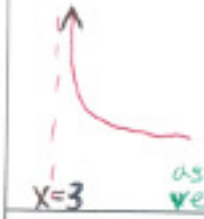
$S_n-rS_n=a-ar^n$

$S_n(1-r)=a(1-r^n)$

$\frac{1-r}{1-r}$ $\frac{a(1-r^n)}{1-r}$

$S_n=\frac{a(1-r^n)}{(1-r)}$

4) Describe the values of $f(x)=-5\log_4(x-3)-1$ as x approaches 3.




As $x\to3$, $y\to\infty$.

The graph goes upforever as x approaches the vertical asymptote $x=3$.

5) Evaluate:

$\frac{1}{2}\log\left(\frac{1}{100}\right)-3\log_7(49)+3\ln(1)$

$\log_{10}\sqrt{\frac{1}{100}}-3(2)+3(0)$

$\log_{10}\left(\frac{1}{10}\right)-6+0$

$-1-6+0=\boxed{-7}$

6) Find the value of $\log_7 90$ two different ways. Show what you typed in your calculator.

$\frac{\log 90}{\log 7}\approx\boxed{2.31}$

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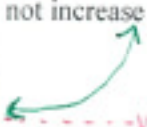
7) Why do the values of $y=5(2)^x-1$ not increase at a constant rate?




The graph gets steeper and steeper as x approaches $\infty$.

Find the inverse of $y=5(2)^x-1$.

*(Fully expand the result)*

$x=5(2)^y-1$

$+1 \quad +1$

$\frac{x+1}{5}=\frac{5(2)^y}{5}$

$2^y=\frac{x+1}{5}$

$\log_2\left(\frac{x+1}{5}\right)=y$

$\boxed{y=\log_2(x+1)-\log_2(5)}$

8) Assume a gallon of gasoline costs \$4 today. You believe that the cost of gasoline will increased in cost by 2% every year. If you are true, how much will a gallon of gasoline cost in 40 years?

$A=4(1.02)^{40}\approx\$8.83$

Also, how long will it take for the price of gasoline to double?

$\frac{8}{4}=\frac{4(1.02)^t}{4}$

$1.02^t=2$

$\log_{1.02}(2)=t$

$t=\frac{\log 2}{\log 1.02}\approx\boxed{35\text{ yrs}}$

9) Your business profited \$2000 this month. Each month, you think you will profit 15% more than the previous month. How much will you have profited in a year?

$S_{12}=\frac{2000(1-1.15^{12})}{(1-1.15)}$

$\boxed{\$58003.33}$

How long would it take for you to have profited \$100,000?

$100{,}000=\frac{2000(1-1.15^t)}{(1-1.15)}$

$\frac{-15000}{2000}=\frac{2000(1-1.15)^t}{2000}$

$-7.5=1-1.15^t$

$-1 \quad -1$

$\frac{-1.15^t}{-1}=\frac{-8.5}{-1}$

$1.15^t=8.5$

$\log_{1.15}(8.5)=t$

$\boxed{t=15.3\text{ months}}$