Exponential/Logarithmic Functions and Their Graphs **Name** KEY

Pre-Calculus Notes **Period**________

When determining transformations from a graph, you should look for and compare key points or features from the original graph to the transformed graph.

Some of the key features that you will need to identify are x- and y-intercepts, asymptotes, and end behavior. End behavior asks what the function approaches as x approaches $-\infty$ and ∞.

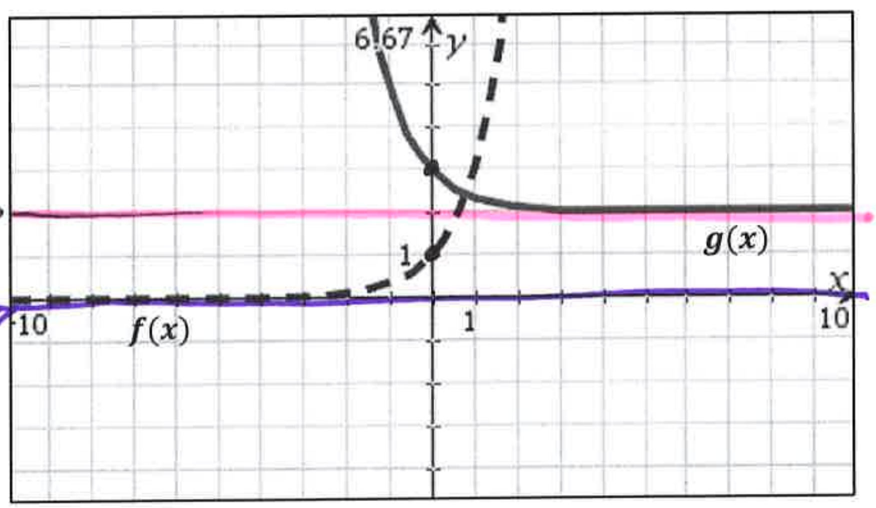
$f(x)$ $(g(x)$

Example 1: Given the graphs below of functions and their transformed graphs, determine which transformations occurred and write a new equation based on those transformations.

Also, list the following key features for $g(x)$: x- and y-intercepts, the asymptote, and end behavior.

a.

asymptote $y=2$



Asymptote $y=0$

(looks like it crosses/touches the x-axis, but it doesn't)

$f(x) = 3^x$

Reflect over y

up 2

$g(x) = 3^{-x} + 2$

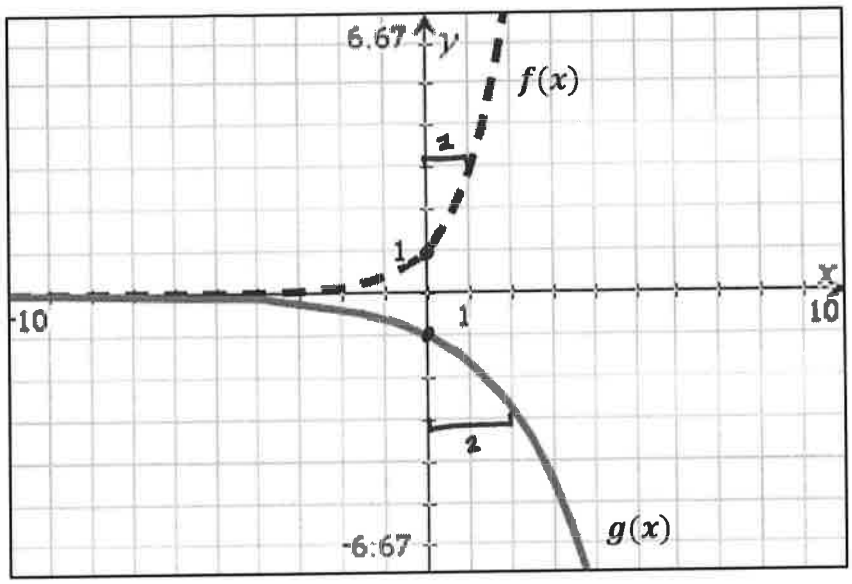
x-intercept (remember, this is where it crosses the x-axis) None

y-intercept (remember, this is where it crosses the y-axis) (0, 3)

asymptote (could be vertical or horizontal) $y=2$

end behavior: As $x \to -\infty, f(x) \to$ ∞ (read "as x approaches negative infinity, *f(x)* approaches"

As $x \to \infty, f(x) \to$ 2 (read "as x approaches positive infinity, *f(x)* approaches" b.



$f(x) = e^x$

Reflect over X
Horizontal Stretch by 2

$g(x) =$ $-e^{\frac{1}{2}x}$

x-intercept None

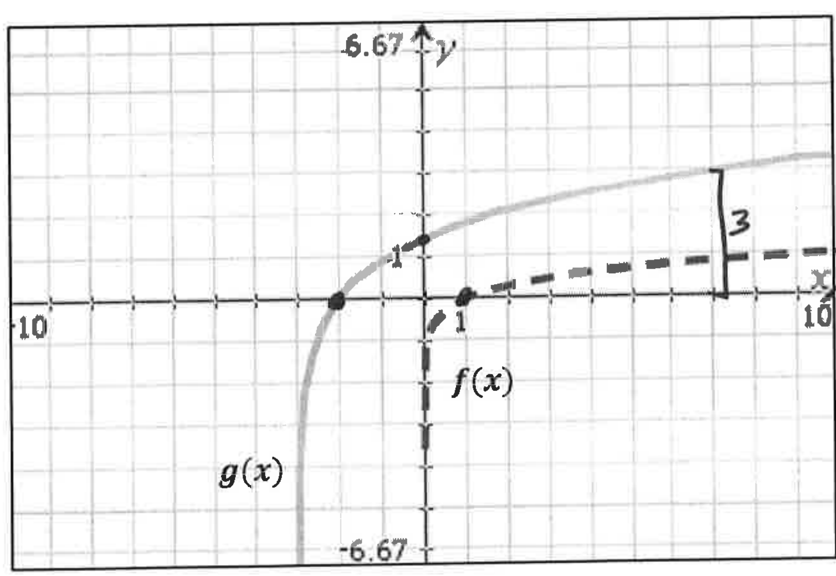
y-intercept (0,-1)

asymptote y=0

end behavior: As $x \to -\infty, f(x) \to$ 0

As $x \to \infty, f(x) \to$ $-\infty$

c.



$f(x) = \log x$

Vertical stretch by 3
Left 3

$g(x) =$ 3 log(x+3)

x-intercept (-2,0)

y-intercept (0,1.4) ?

asymptote X=-3

end behavior: As $x \to \overset{-3}{\cancel{-\infty}}, f(x) \to$ $-\infty$

As $x \to \infty, f(x) \to$ ∞

Pre-Calculus: Exponential/Log functions

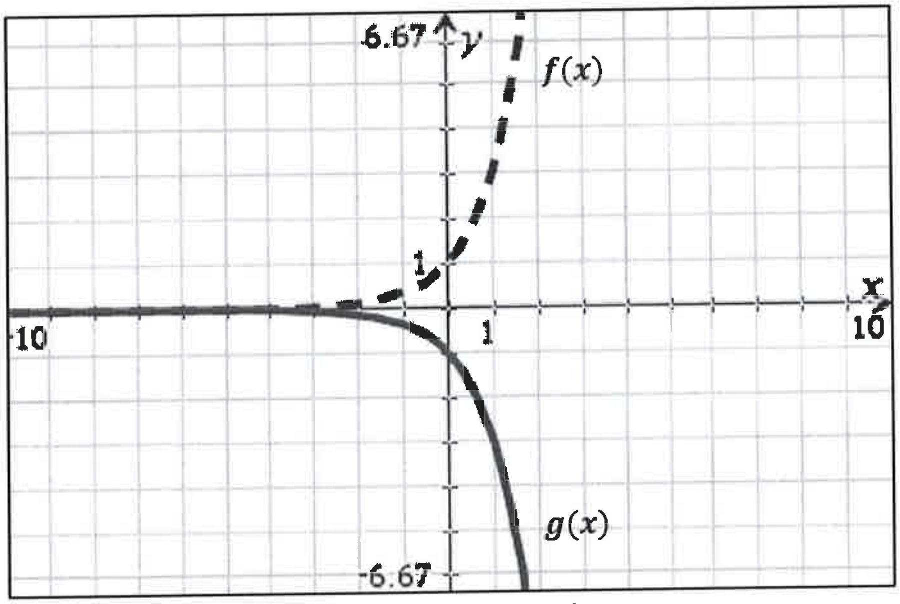
Name ____________________

Day 2

Date ____________ Per ______

Given the graphs below of functions and their transformed graphs, determine which transformations occurred and write a new equation based on those transformations. Also, identify the key features of ***g(x)***.

1)



$f(x) = 3^x$

Reflect over x

$g(x) =$ -3^x

x-intercept None

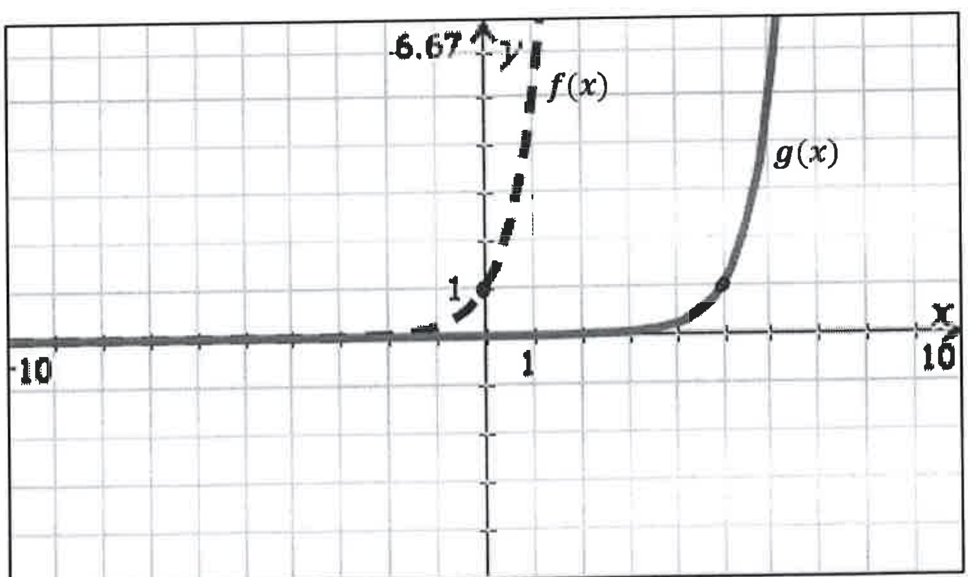
y-intercept (0,-1)

asymptote y=0

end behavior: As $x \to -\infty, f(x) \to$ 0

As $x \to \infty, f(x) \to$ $-\infty$

2)



$f(x) = 5^x$

Right 5

$g(x) =$ 5^{x-5}

x-intercept None

y-intercept (0,0...)

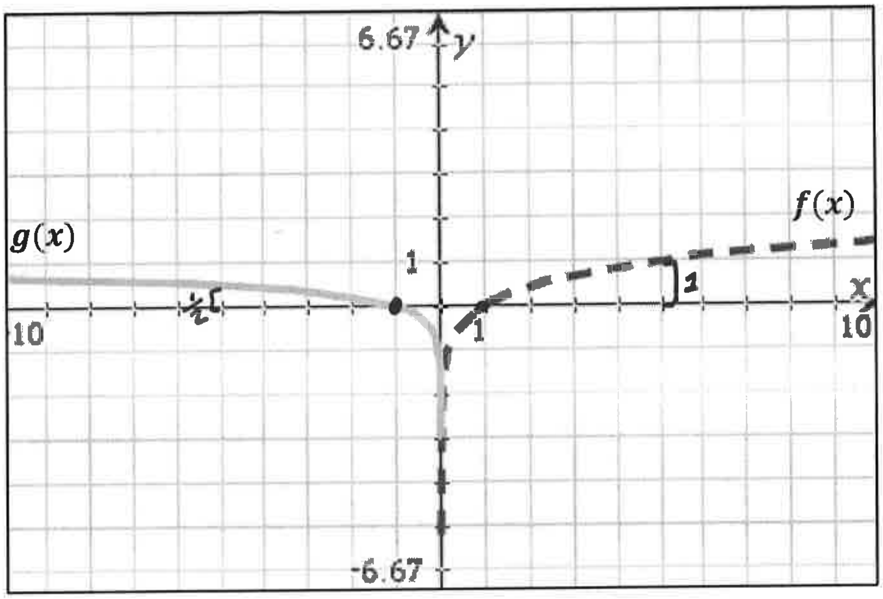
Almost "0" but can't be =0, so can't tell

asymptote y=0

end behavior: As $x \to -\infty, f(x) \to$ 0

As $x \to \infty, f(x) \to$ ∞

3)



$f(x) = \log_5 x$

vertical shrink by 2
Reflect over y-axis

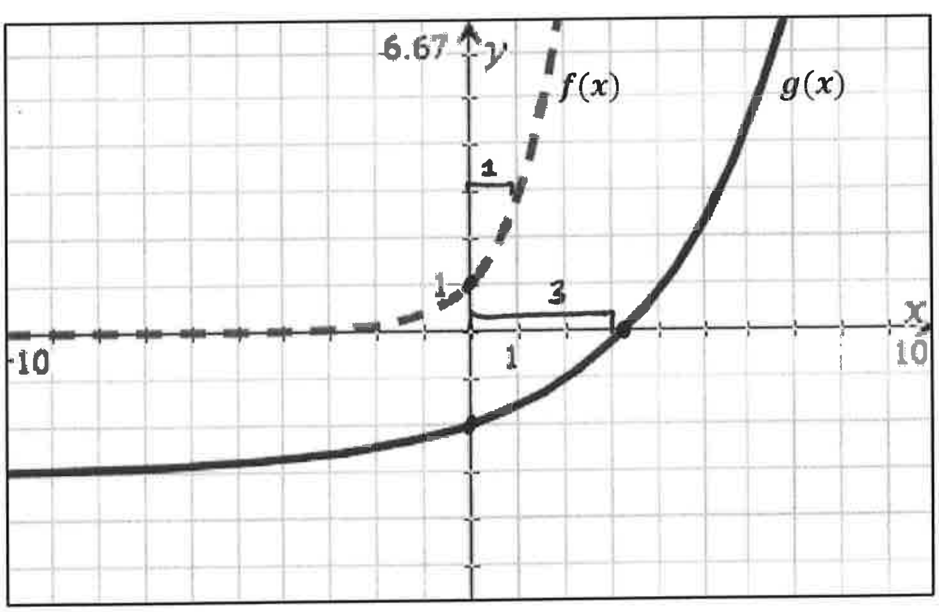
$g(x) = \frac{1}{2}\log_5(-x)$

x-intercept (-1,0)   y-intercept None

asymptote X=0   end behavior: As $x \to -\infty, f(x) \to$ ∞

As $x \to \cancel{\infty}\ 0, f(x) \to$ -∞

4)



$f(x) = e^x$

Horizontal stretch by 3
Down 3

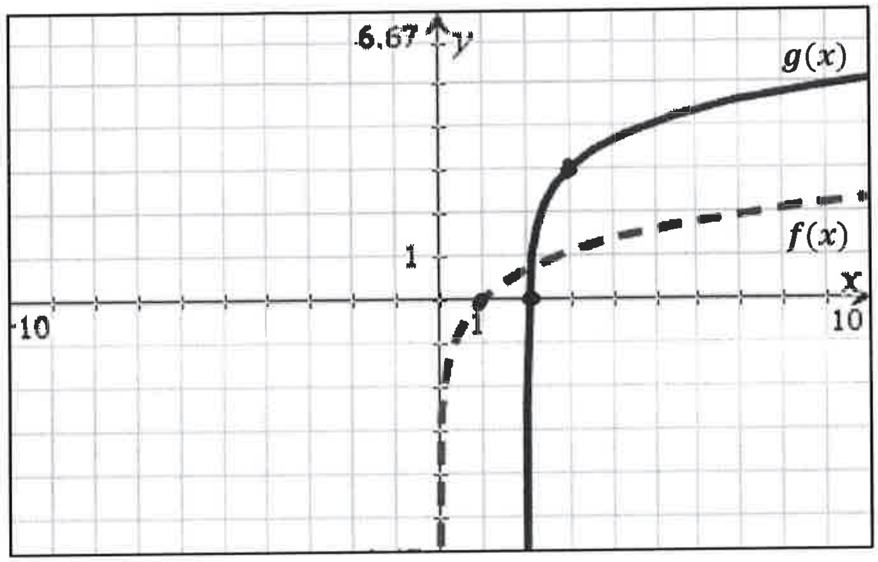
$g(x) = e^{\frac{1}{3}x} - 3$

x-intercept (3.1, 0)?   y-intercept (0,-2)

asymptote y=-3   end behavior: As $x \to -\infty, f(x) \to$ -3

As $x \to \infty, f(x) \to$ ∞

5)



$f(x) = \ln x$

Right 2

up 3

$g(x) = \underline{\ln(x-2)+3}$

Can't be 2 because of

x-intercept $\underline{(2.01, 0)}$

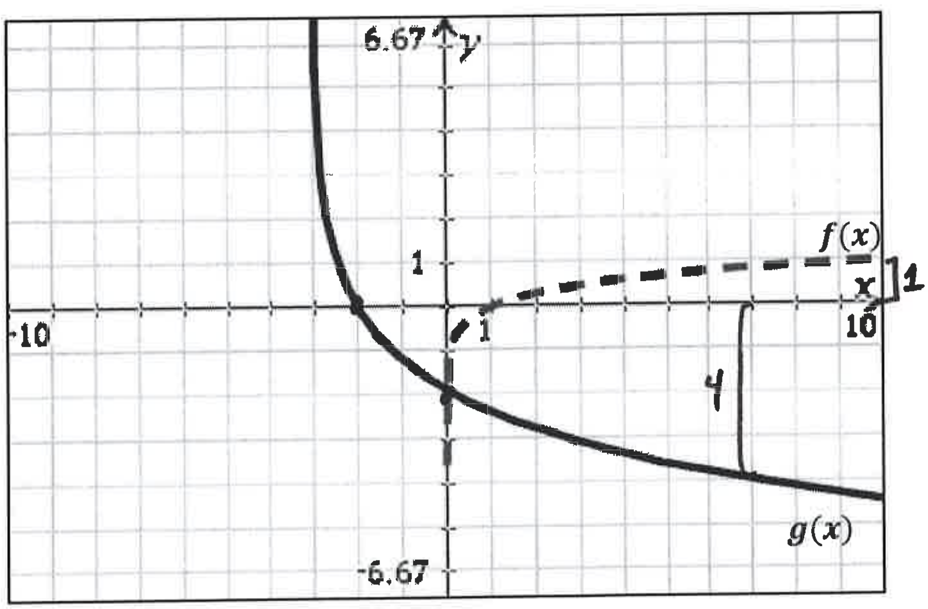
y-intercept $\underline{\text{None}}$

asymptote $\underline{x=2}$

end behavior: As $x \to \cancel{0}\ 2$, $f(x) \to \underline{-\infty}$

As $x \to \infty$, $f(x) \to \underline{\infty}$

6)



$f(x) = \log x$

Reflect over x-axis

Vertical Stretch by 4

left 3

$g(x) = \underline{-4\log(x+3)}$

x-intercept $\underline{(-2, 0)}$

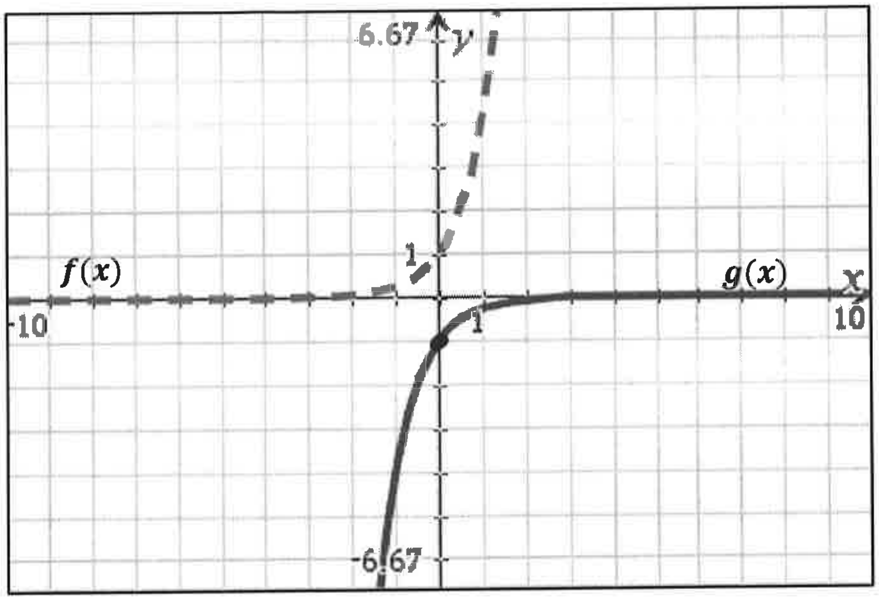
y-intercept $\underline{(0, -2)}$

asymptote $\underline{x=-3}$

end behavior: As $x \to \cancel{-\infty}\ {-3}$, $f(x) \to \underline{\infty}$

As $x \to \infty$, $f(x) \to \underline{-\infty}$

7)



$f(x) = 4^x$

Reflect over x-axis and y-axis

$g(x) = -4^{-x}$

x-intercept None

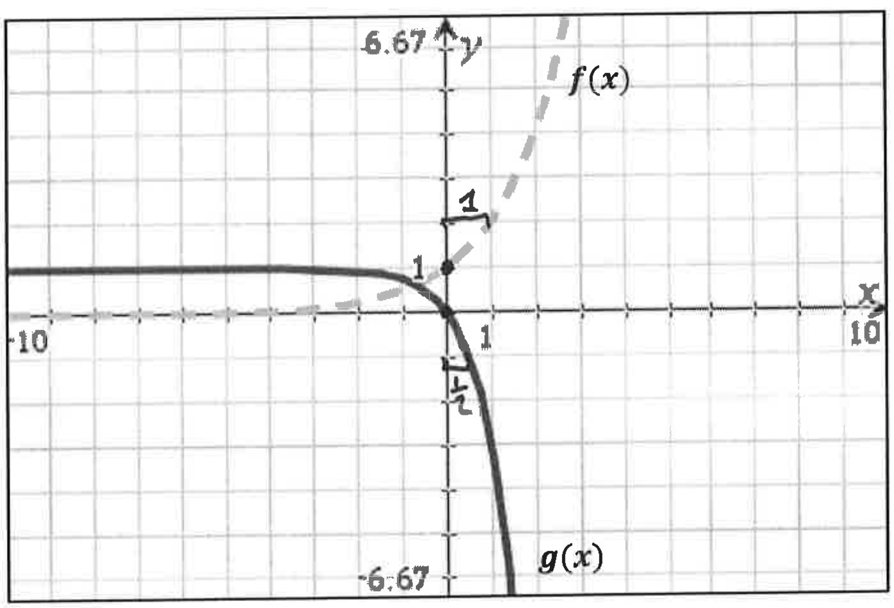
y-intercept (0, -1)

asymptote $y=0$

end behavior: As $x \to -\infty, f(x) \to -\infty$

As $x \to \infty, f(x) \to 0$

8)



$f(x) = 2^x$

Reflect over x-axis

Horizontal shrink by 2

Up 1

$g(x) = -2^{2x}+1$

x-intercept (0, 0)

y-intercept (0, 0)

asymptote $y=1$

end behavior: As $x \to -\infty, f(x) \to 1$

As $x \to \infty, f(x) \to -\infty$