

Please work together, however students must hand in their own lab. **Remember to show any work, NEATLY, and in PENCIL, please ☺, so to that end you may want to do your scratch work on a separate paper, transfer neat work to this, and staple your scratch to this. Make sure you number your scratch problems. Points are deducted for illegible work. (100 pts)**

1. Given  $f(x) = 2x - 3$  (10pts)

a. Find  $f^{-1}(x)$ . Show work:

$$f^{-1}(x) =$$

b. Find  $f(5)$  and call that value  $t$ . Then find  $f^{-1}(t)$ .

$$f^{-1}(t) =$$

2. Use the Inverse Function Property to show that  $f(x) = x^3 + 1$  and  $g(x) = (x - 1)^{\frac{1}{3}}$  are inverses. (10pts)

$$(f \circ g)(x) =$$

$$(g \circ f)(x) =$$

3. Graph  $f(x) = \sqrt{2x - 4}$  on your calculator. (15pts)

a. What is the domain of  $f(x)$ ?

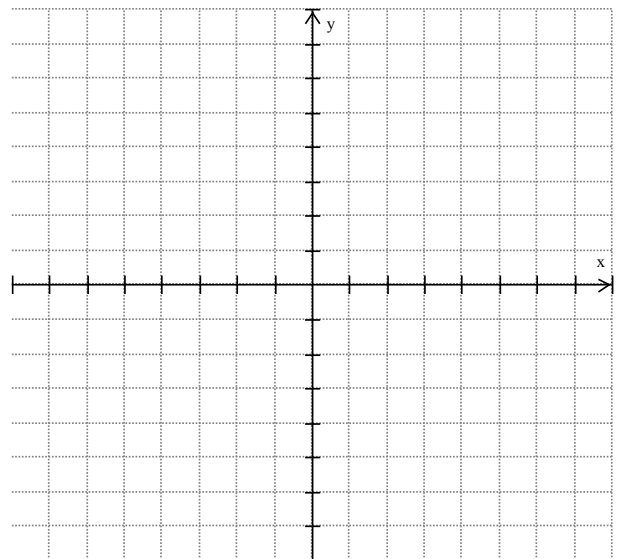
b. What is the range of  $f(x)$ ?

c. **Carefully** sketch a graph of  $f(x)$  and use it to sketch the inverse of  $f(x)$  on the axes.

d. What is the domain of  $f^{-1}(x)$ ?

e. What is the range of  $f^{-1}(x)$ ?

Label units on your axes:



4. Use the laws of exponents to simplify the following expressions: (9 pts)

a)  $(3^{-2})^{\frac{1}{2}} =$

b)  $\left(\frac{8}{125}\right)^{-\frac{1}{3}} =$

c)  $(2^3 + 2^5)^2 =$

5. Given the following functions:  $f(x) = 5^{-x}$        $g(x) = 3^{2x+1}$        $h(x) = e^{x-1} + 3$  (12 pts)

Use your calculator to evaluate the functions above at the indicated values. Round to 5 decimal places as needed:

a.  $f(5) =$

$f\left(-\frac{1}{2}\right) =$

b.  $g(-\sqrt{3}) =$

$g(\pi) =$

c.  $h(0) =$

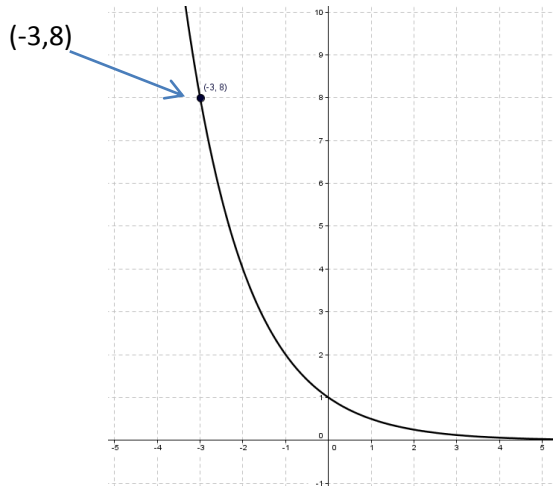
$h(\sqrt{2}) =$

6. If \$4000 is borrowed at a rate of 5.75% interest per year, compounded quarterly find the amount due at the end of 6 years. (8 pts)

7. Below is the graph of a function of the form  $f(x) = a^x$ .

(20 pts)

a. Find the function. **Show your work!**

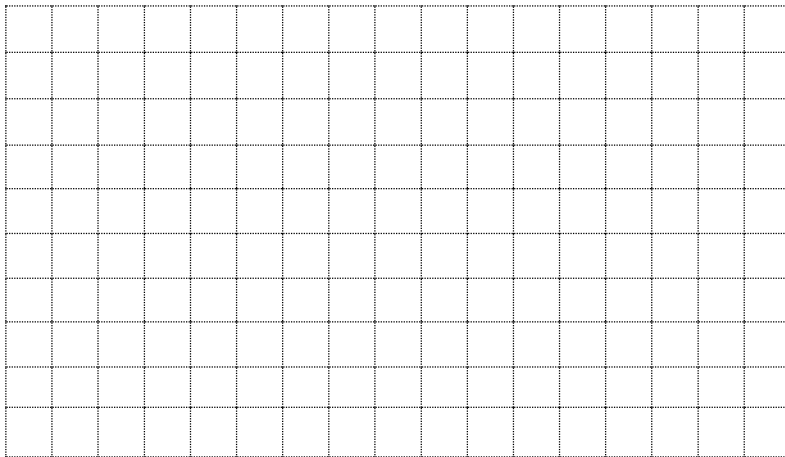


$f(x) =$

b. What is the asymptote of this function?

c. What is the domain and range of this function?

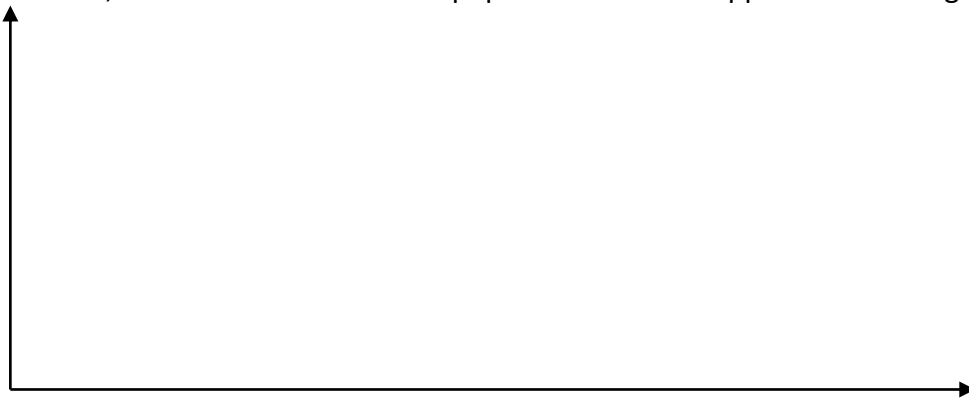
d. Using transformations, take the graph of  $f(x)$  and sketch the graph a new function  $g(x) = -f(x) + 3$  Hint: be sure to show where  $(0,1)$  & the asymptote have moved to! And show and label your axes.



8. The growth rate of the world population has been decreasing steadily in recent years. Some researchers are predicting that the population will eventually stabilize. One such model is based on the following function, where  $P(t)$  is the population in billions and  $t$  is time (**starting at the year 2000 when  $t=0$** ). (8 pts)

$$P(t) = \frac{73.2}{6.1 + 5.9e^{-0.02t}}$$

- a. What world population does this model predict for the year 2200? (Use your calculator table)
- b. Graph the function on your calculator. Change the xmax to 500 and the ymax to 20. According to the model, what size does the world population seem to approach as time goes on? Sketch the graph here:



9. Fill in the table: (8 pts)

Exponential Form	Logarithmic Form
$5^3 = 125$	
	$\log_2\left(\frac{1}{8}\right) = -3$
$8^3 = 512$	
	$\log_3 729 = 6$