Math 110 Common Exam #1

February 9, 2022

Time: 1 hour and 25 minutes

Instructions: Show all work for full credit.
No outside materials or calculators allowed.

Extra Space: Use the backs of each sheet for extra space. Clearly label when doing so.

Name: key

ID #: _____

Instructor/Section: _____

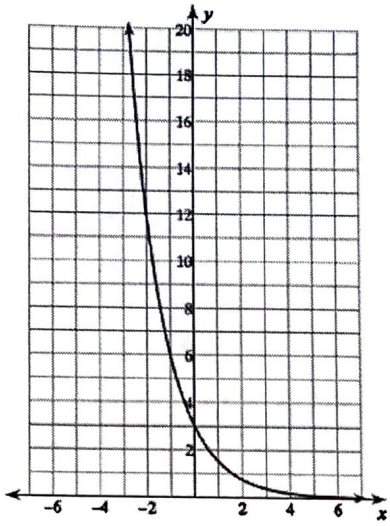
"I pledge by my honor that I have abided by the NJIT Academic Integrity Code."

_____ (Signature)

Problem		Score
1		
2		
3		
4		
5		
6		
7		
8		
9		

1. For each of the following functions state the requested information. If something is not there, write "None". Please write the domains and ranges in interval notation, and the intercepts as "x = " or "y = ". (6 pts each)

a.



a.

I. The domain $(-\infty, \infty)$

II. The range $(0, \infty)$

III. All x – intercepts None

IV. All y – intercepts $y = 3$

V. All present asymptotes (x and/or y) HA: $y = 0$

VI. Whether the function is increasing or decreasing (from left to right) Decreasing

b. $y = \frac{1}{4} \cdot 8^{x+1} + 2$

IV. y-int $\Rightarrow x = 0$

$y = \frac{1}{4} 8^{1} + 2 = 4$

b.

I. The domain $(-\infty, \infty)$

II. The range $(2, \infty)$

III. All x – intercepts none

IV. All y – intercepts $y = 4$

V. All present asymptotes (x and/or y) HA: $y = 2$

VI. Whether the function is increasing or decreasing (from left to right) Increasing

c. $y = -\log_4(x + 5)$

c.

I. The domain $(-5, \infty)$

II. The range $(-\infty, \infty)$

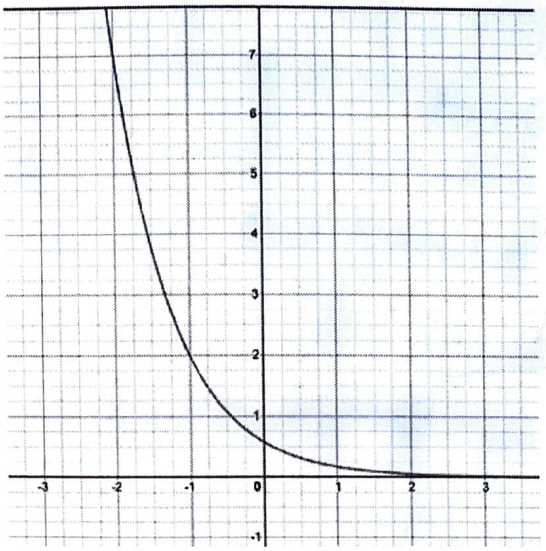
III. All x – intercepts $x = -4$

IV. All y – intercepts $y = -\log_4 5$

V. All present asymptotes (x and/or y) VA: $x = -5$

VI. Whether the function is increasing or decreasing (from left to right) Decreasing

2. Find the equation of the graph in $y = a \cdot b^x$ form. (4 pts)



$y = a \cdot b^x$

points: $(-1, 2)$
$(-2, 7)$

$\begin{cases} 7 = ab^{-2} \\ 2 = ab^{-1} \end{cases} \rightarrow a = 2b$

$7 = \frac{2b}{b^2} \rightarrow 7 = \frac{2}{b} \rightarrow b = \frac{2}{7}$

$\rightarrow a = \frac{4}{7}$

$\therefore \boxed{y = \frac{4}{7}\left(\frac{2}{7}\right)^x}$

3. Evaluate the following: (4 pts each)

a. $log_{10} 10 = 1$

b. $log_{11} \frac{1}{121} = -2$

4. Use the given information to find an expression for the question in terms of a combination of the variables: (3 pts)

$\log_6 4 = U$
$\log_6 9 = V$
$\log_6 10 = W$
Find $\log_6 600$

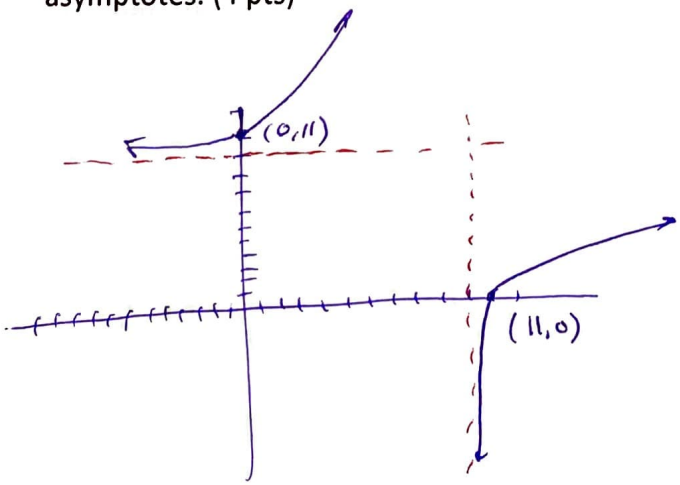
$\log_6 600 = \log_6 (6 \cdot 100)$
$= \log_6 6^1 + \log_6 10^2$
$= 1 + 2\log_6 10$
$= \boxed{1 + 2W}$

5. Consider the function $y = \ln(x - 10)$

a. Find the inverse of the function. (3 pts)

$x = \ln(y-10) \rightarrow e^x = y - 10 \rightarrow \boxed{y = e^x + 10}$

b. Graph both the original function and its inverse on the same coordinate plane. Be sure to label at least one identifying point on each function and any asymptotes. (4 pts)

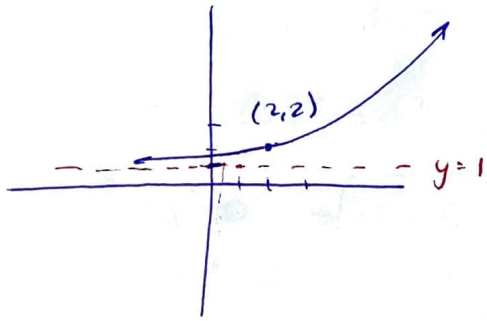


HA: $y = 10$
VA: $x = 10$

6. Graph the following; be sure to label any asymptotes AND at least 1 identifying point. (5 pts each)

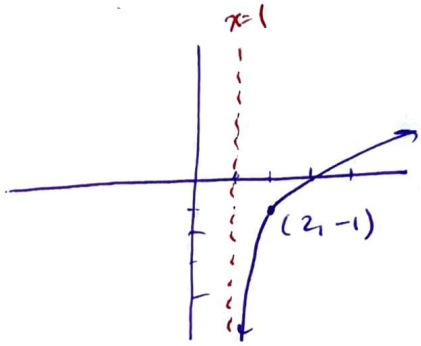
a. $y = e^{x-2} + 1$

Right 2
Up 1



b. $y = \ln(x-1) - 1$

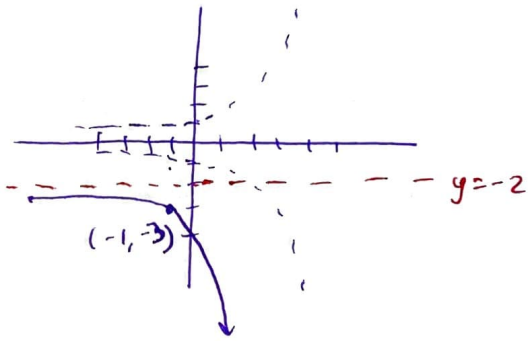
Right 1
Down 1



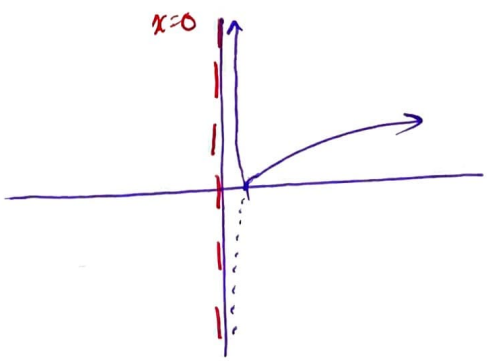
c. $y = -2 - (2)^{x+1}$

$y = -2^{x+1} - 2$

Reflect over x-axis
Left 1
Down 2



d. $y = |\ln(x)|$



7. Solve the following for all solutions; identify any extraneous: (5 pts each)

a. $\frac{1}{a^2}+\frac{4a+8}{a^2}=\frac{1}{3a^2}$ → $\frac{4a+9}{a^2}=\frac{1}{3a^2}$

→ $3a^2(4a+9)=a^2$ → $12a^3+27a^2=a^2$ → $12a^3+26a^2=0$

$2a^2(6a+13)=0$ $\quad 2a^2=0 \rightarrow a=0$ Extraneous

$6a+13=0 \rightarrow a=-\frac{13}{6}$

b. $\log_8 x-\log_8(x+1)=2$

→ $\log_8 \frac{x}{x+1}=2$ → $\frac{x}{x+1}=8^2=64$ → $x=64x+64$

→ $-63x=64$ → $x=-\frac{64}{63}$ not in Domain ∴ No solution

c. $\ln 4+\ln(2x-3)=\ln 38$

$e^{\ln(4(2x-3))}=e^{\ln 38}$ → $8x-12=38$

→ $8x=50$ → $x=\frac{50}{8}$

d. $-9\cdot 16^{m-6}=-34$ → $16^{m-6}=\frac{34}{9}$

$\ln 16^{m-6}=\ln\frac{34}{9}$

$(m-6)\ln 16=\ln 34/9$

$m-6=\frac{\ln 34/9}{\ln 16}$

$m=\frac{\ln 34/9}{\ln 16}+6$

or

$\log_{16}(16^{m-6})=\log_{16}(\frac{34}{9})$

$m-6=\log_{16}\frac{34}{9}$

$m=\log_{16}\frac{34}{9}+6$

8. Find the inverses of the following functions: (5 pts each)

a. $y = \log_6(x^5 + 6) + 4$ → $x = \log_6(y^5+6) + 4$

$6^{(x-4)} = 6^{\log_6(y^5+6)}$ → $6^{x-4} = y^5 + 6$

→ $6^{x-4} - 6 = y^5$ → $\boxed{y = \sqrt[5]{6^{x-4} - 6}}$

or →

$(x-4)\ln 6 = \ln(y^5+6)$

$x - 4 = \frac{\ln(y^5+6)}{\ln 6}$

$\boxed{x = \frac{\ln(y^5+6)}{\ln 6} + 4}$

b. $y = 5\ln(-4x + 3)$

$e^{\left(\frac{y}{5}\right)} = e^{\ln(-4x+3)}$ → $e^{y/5} = -4x + 3$ → $\frac{e^{y/5} - 3}{-4} = x$

∴ Inverse: $y = \frac{e^{x/5} - 3}{-4}$

c. $y = \left(\frac{3^x+6}{-2}\right)^{1/2}$ → $x = \left(\frac{3^y+6}{-2}\right)^{1/2}$

→ $x^2 = \frac{3^y+6}{-2}$ → $(-2x^2 - 6) = 3^y$

$\log_3$ $\log_3$

→ $\boxed{y = \log_3(-2x^2-6)}$ * DNE

9. Graph the following piecewise function 5 pts: $y = \begin{cases} \left(\frac{1}{2}\right)^x & , x \le 0 \\ 3x & , x > 0 \end{cases}$ → 2^{-x} , $x \le 0$