Math 114
Midterm 3
Thu Mar 11, 2010

Name: _____

SCORE: _____ / 101 POINTS

NO CALCULATORS ALLOWED

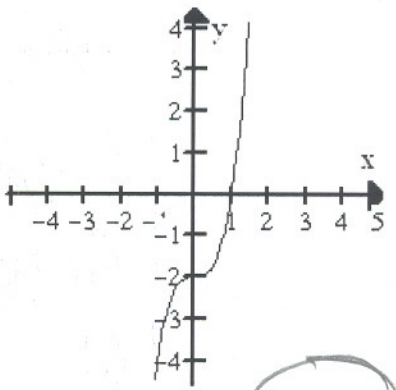
PUT A BOX AROUND EACH FINAL ANSWER

Fill in the blanks. Write "**UNDEFINED**" if the value does not exist. **[NO NEED TO SHOW WORK]** SCORE: ___ / 21 POINTS

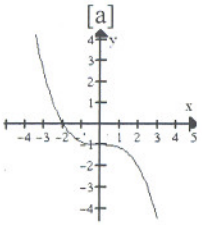
$\log_9 1 =$ 0 $\quad \log 100{,}000 =$ 5 $\quad 6^{\log_6 3} =$ 3 $\quad \log_8 8^{-8} =$ −8

$10^{\log(-5)} =$ UNDEF $\quad \log_3 81 =$ 4 $\quad \log_4 0 =$ UNDEF

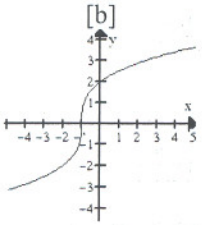
Circle the graph of the inverse of the following function. SCORE: ___ / 6 POINTS



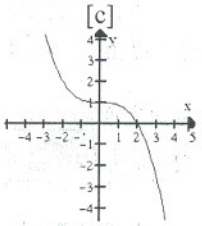
[a]



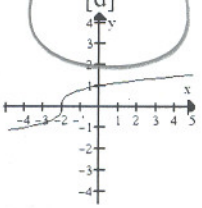
[b]



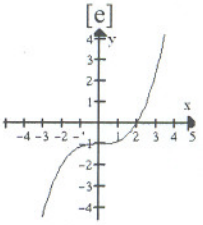
[c]



[d]

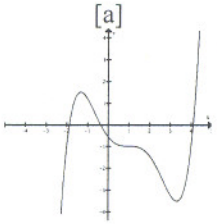


[e]

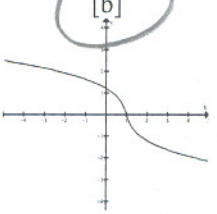


Circle the **two** graphs below which represent one-to-one functions. SCORE: ___ / 6 POINTS

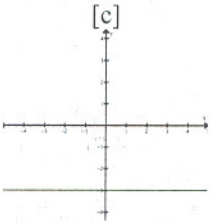
[a]



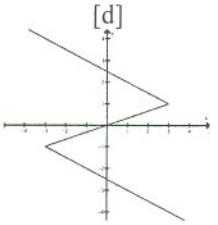
[b]



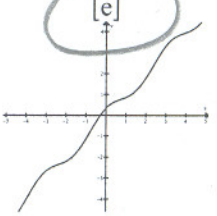
[c]



[d]



[e]



Circle the domain of $f(x) = \log_7 x$. SCORE: ___ / 3 POINTS

[a] $\{x \neq 7\}$ [b] **R** [c] $\{x \neq 0\}$ [d] $\{x > 0\}$ [e] $\{x > 7\}$

Circle the range of $f(x) = \log_5 x$. SCORE: ___ / 3 POINTS

[a] $\{x \neq 5\}$ [b] **R** [c] $\{x \neq 0\}$ [d] $\{x > 0\}$ [e] $\{x > 5\}$

Find the equation of the asymptote of $f(x) = 2\log_5(x-6)$. **SHOW PROPER WORK.** **SCORE: ___ / 6 POINTS**

$x - 6 = 0$

$\boxed{x = 6}$

Find the range of the function $f(x) = 2 - \sqrt{6+x}$. **SHOW PROPER WORK.** **SCORE: ___ / 6 POINTS**

$\sqrt{6+x} \geq 0$

$-\sqrt{6+x} \leq 0$

$f(x) = 2 - \sqrt{6+x} \leq 2$

$\boxed{\{y \leq 2\}}$

Find the domain of the function $f(x) = 7 - \frac{4}{2x-10}$. **SHOW PROPER WORK.** **SCORE: ___ / 6 POINTS**

$2x - 10 \neq 0$

$\boxed{\{x \neq 5\}}$

Find the inverse of the function $f(x) = 3 - \sqrt{x+5}$. **SHOW PROPER WORK.** **SCORE: ___ / 10 POINTS**

$y = 3 - \sqrt{x+5}$

$x = 3 - \sqrt{y+5}$

$x - 3 = -\sqrt{y+5}$

$(x-3)^2 = y + 5$

$y = (x-3)^2 - 5$

$\boxed{f^{-1}(x) = (x-3)^2 - 5 \text{ or } (3-x)^2 - 5}$

Write $\log 30 - \log 5 + \log 3$ as the logarithm of a single quantity. **Simplify your answer.** **SCORE: ___ / 6 POINTS**

$$\log \tfrac{30}{5} + \log 3 = \log 6 + \log 3 = \log(6 \cdot 3)$$

$$= \boxed{\log 18}$$

Write $\log \dfrac{w^2}{zy^5}$ as the sums and/or differences and/or multiples of logarithms of single variables. **SCORE: ___ / 6 POINTS**

$$2\log w - \log z - 5\log y$$

Solve for x: $8^{1-x} = 4^{x+4}$. **SHOW PROPER WORK. CHECK YOUR ANSWER(S).** **SCORE: ___ / 10 POINTS**

$$2^{3(1-x)} = 2^{2(x+4)}$$

$$3(1-x) = 2(x+4)$$

$$3 - 3x = 2x + 8$$

$$-5x = 5$$

$$\boxed{x = -1}$$

CHECK:

$$8^{1-(-1)} = 8^2 = 64$$

$$4^{-1+4} = 4^3 = 64$$

✓

Solve for x: $\log_3(x^2 - 13) - \log_3(1 - x) = 2$. **SHOW PROPER WORK. CHECK YOUR ANSWER(S).** **SCORE: ___ / 12 POINTS**

$$\log_3 \frac{x^2-13}{1-x} = 2$$

$$\frac{x^2-13}{1-x} = 3^2 = 9$$

$$x^2 - 13 = 9(1-x)$$

$$x^2 - 13 = 9 - 9x$$

$$x^2 + 9x - 22 = 0$$

$$(x+11)(x-2) = 0$$

$$x = -11, 2$$

CHECK:

~~$x = 2$~~: $\log_3(-9)$ UNDEFINED

$\boxed{x = -11}$ $\log_3 108 - \log_3 12$

$$= \log_3 \frac{108}{12}$$

$$= \log_3 9$$

$$= 2 \quad ✓$$