Math 114
Midterm 3
Tue Jun 9, 2009

Name: _____

SCORE: _____ / 102 POINTS

- ALL PROBLEMS MUST BE SOLVED ALGEBRAICALLY TO EARN CREDIT
- PUT A BOX AROUND EACH FINAL ANSWER
- SHOW COMPLETE AND PROPER WORK TO EARN FULL CREDIT

NO CALCULATORS ALLOWED

Evaluate the following. Write "UNDEFINED" if the value does not exist. SCORE: ___ / 14 POINTS

[a] $\log_4 64 =$ 3

[b] $\log_5 0 =$ UNDEFINED

[c] $\log_8 1 =$ 0

[d] $\log 10{,}000{,}000 =$ 7

[e] $\log_8 8^{-3} =$ -3

[f] $3^{\log_3 7} =$ 7

[g] $10^{\log(-5)} =$ UNDEFINED

Find the range of the function $f(x) = 9 - \sqrt{7+x}$. SCORE: ___ / 6 POINTS

$\sqrt{7+x} \geq 0$

$-\sqrt{7+x} \leq 0$

$9 - \sqrt{7+x} \leq 9$

$\{y \leq 9\}$

Write $\log \frac{a^2}{bc^3}$ as the sums and/or differences and/or multiples of logarithms of single variables. SCORE: ___ / 6 POINTS

$2\log a - \log b - 3\log c$

Find the inverse of the function $f(x) = 9 - \sqrt{7+x}$. SCORE: ___ / 10 POINTS

$y = 9 - \sqrt{7+x}$

$x = 9 - \sqrt{7+y}$

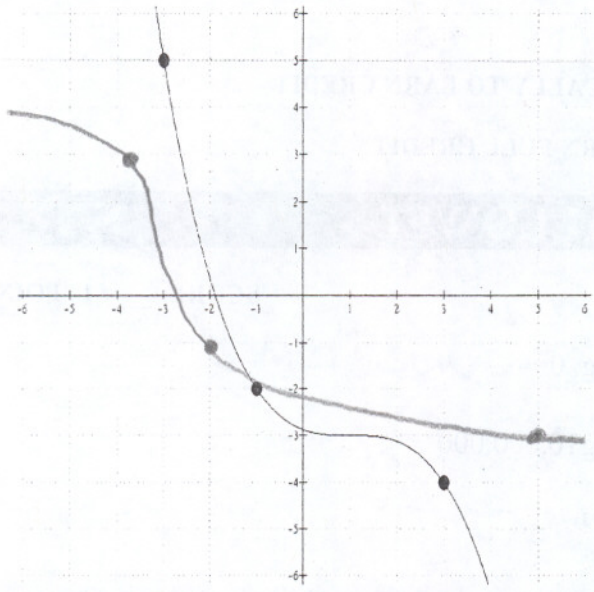
$x - 9 = -\sqrt{7+y}$

$(x-9)^2 = 7+y$

$y = (x-9)^2 - 7$

$f^{-1}(x) = (x-9)^2 - 7$

Sketch the graph of the inverse of the following function on the same set of axes. **SCORE: ___ / 10 POINTS**

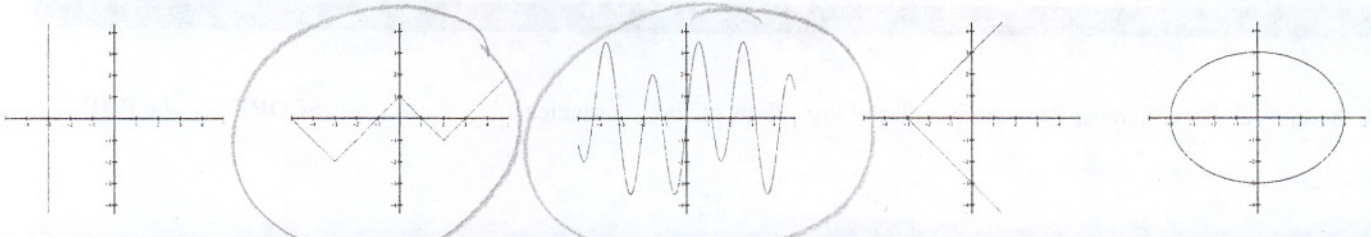


Find the equation of the asymptote of $f(x) = -4\log_3(x-6)$. **SCORE: ___ / 6 POINTS**

$x - 6 = 0$

$\boxed{x = 6}$

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



Solve for x: $\log_5(x^2-9) - \log_5(1-x) = 1$. **CHECK YOUR ANSWER(S).** **SCORE: ___ / 10 POINTS**

$\log_5 \frac{x^2-9}{1-x} = 1$

$\frac{x^2-9}{1-x} = 5^1 = 5$

$x^2 - 9 = 5 - 5x$

$x^2 + 5x - 14 = 0$

$(x+7)(x-2) = 0$

$x = -7$ OR 2

CHECK: $\boxed{x = -7}$

$\log_5(49-9) - \log_5(8)$

$= \log_5(40) - \log_5(8)$

$= \log_5 5 = 1$ ✓

$x = 2$

$\log_5(4-9) - \log_5(1-2)$

$= \log_5(-5) - \log_5(-1)$ X

If $f(x) = 2x^2 - 3x - 1$, find $f(a-3)$.

SCORE: ___ / 8 POINTS

$$f(a-3) = 2(a-3)^2 - 3(a-3) - 1$$
$$= 2(a^2 - 6a + 9) - 3a + 9 - 1$$
$$= 2a^2 - 12a + 18 - 3a + 8$$
$$= \boxed{2a^2 - 15a + 26}$$

Solve for x: $2^{1-2x} = 32$. **CHECK YOUR ANSWER(S).**

SCORE: ___ / 8 POINTS

$$2^{1-2x} = 2^5$$
$$1 - 2x = 5$$
$$-2x = 4$$
$$\boxed{x = -2}$$

CHECK: $2^{1-2(-2)}$
$= 2^5$
$= 32$ ✓

Find the domain of the function $f(x) = 4 - \dfrac{7}{6-3x}$.

SCORE: ___ / 6 POINTS

$$6 - 3x \neq 0$$
$$-3x \neq -6$$
$$\boxed{\{x \neq 2\}}$$

Write $\log 12 - \log 6 + \log 2$ as the logarithm of a single quantity. **Simplify your answer.**

SCORE: ___ / 6 POINTS

$$\log\left(\frac{12}{6} \cdot 2\right) = \log 4$$

Circle the two graphs below which represent one-to-one functions.

SCORE: ___ / 6 POINTS