

Math 199 Mock Exam 3 · 17 November, 2014

1. Suppose  $\ln(x) = 3$ ,  $\ln(y) = 7$ ,  $\ln(z) = 9$ , and  $b = e^2$ . Simplify  $\log_b\left(\frac{x^2y}{z}\right)$ .

2. Solve for  $x$ .

$$10^{2x+5} = 100^{x^2}$$

3. Which expression is equivalent to  $4^x 2^5 = 10$ ?

- (a)  $\log_4(5) - 2 = x$
- (b)  $\log_2(10) = 2x + 5$
- (c)  $x \log(4) + 5 \log(2) = 10$
- (d)  $\log(10) = 5x \log(8)$
- (e) None of the above.

4. Which expression is equivalent to  $y = \log(3^{10}x)$ ?

- (a)  $3 + \log x = y$
- (b)  $y^{10} = 3^{10}x$
- (c)  $10^y = 3^{10}x$
- (d)  $10 = y^{3^{10}x}$
- (e) None of the above.

5. Suppose  $f(x)$  is a rational function with domain  $(-\infty, -1) \cup (-1, 3) \cup (3, \infty)$  and:

- $\lim_{x \rightarrow \infty} f(x) = \infty$
- $\lim_{x \rightarrow -\infty} f(x) = -\infty$
- $\lim_{x \rightarrow -1} f(x)$  exists
- $\lim_{x \rightarrow 3^-} = -\infty$
- $\lim_{x \rightarrow 3^+} = \infty$
- $f(0) = 0$

(a) What are the horizontal asymptotes of the graph of  $y = f(x)$ ? Express your answer as an equation. If there are no horizontal asymptotes, then write NONE.

(b) What are the vertical asymptotes of the graph of  $y = f(x)$ ? Express your answer as an equation. If there are no vertical asymptotes, then write NONE.

(c) What are the holes (removable discontinuities) of the graph of  $y = f(x)$ ? Express your answer as an equation. If there are no holes, then write NONE.

(d) True or false:  $f(x)$  is continuous over  $(3, 4)$ .

(e) Suggest a possible rational function for  $f(x)$ .