NAME: ID#:

TAKE HOME EXAM 3

Solve the following problems showing all your work for full credit.

- 1. Let $f(x) = \sqrt{x-1}$ and $g(x) = x^2 3$. Evaluate the composition. a) (2 pts.) f(g(-1))
 - b) (2 pts.) g(f(0))
 - c) (2 pts.) $(g \circ f)(5)$)
 - d) (5 pts.) f(g(x)) and determine the domain.
 - e) (5 pts.) g(f(x)) and determine the domain.
- 2. (5 pts.) The function $f(x) = \frac{3x-2}{x+1}$, $x \neq -1$ is one-to-one. Find its inverse function.

- 3. Find f⁻¹(x) for the one-to-one function f and graph f and f⁻¹ on the same coordinate axes.
 a) (5 pts.) f(x) = 3x + 2.
 - b) (6 pts.) $f(x) = \sqrt{x-3}$.

4. Solve the equation: a) (5 pts.) $2^{x^2+3} = 64$

b) (4 pts.)
$$e^{-3x} = 7$$

c) (5 pts.)
$$3^{x^2+8} = \frac{1}{9^{3x}}$$

d) (5 pts.)
$$(5.04)^{4x-3} = 13$$

e) (6 pts.)
$$4^x - 6(2)^x + 5 = 0$$

f) (5 pts.)
$$\log_2(x-3) - 1 = 4$$

g) (6 pts.) $\log(x-4) + \log(x+5) = 1$

- 5. Find the domain of the function. Use interval notation. a) (4 pts.) $f(x) = \log_7(5-8x)$
 - b) (5 pts.) $g(x) = \log_{0.5}(2x^2 + 3x)$
- 6. (6 pts.) The formula $D = 5e^{-0.4h}$ can be used to find the number of milligrams D of certain drug that is in patient's bloodstream h hours after the drug was administrated. When the number of milligrams reaches 2, the drug is to be administrated again. What is the time between the injections?

- 7. (5 pts.) Rewrite the expression as a single logarithm. $\frac{1}{7}\log m + \frac{3}{5}\log n - \frac{1}{2}\log z - \frac{3}{4}\log t =$
- **8.** (5 pts.) Use the Laws of Logarithms to rewrite the expression in a form with no logarithm of a product, quotient, root, or power.

$$\log \sqrt[3]{\frac{x(x+1)}{(x+3)^3}}$$

- **9.** Nancy wants to invest \$20,000 in saving certificates that bear an interest rate of 9% per year, compounded monthly.
 - a) (2 pts.) Find the amount after 4 years.
 - b) (5 pts.) How long will it take for the amount to become \$32,000?