Math 102, Ch. 6 Practice Test

Note: No make-up exams will be allowed.
Instead, the lowest score will be dropped.

1. Are the following relations functions?

(a) $\{(1, 2), (1, 3), (2, 3)\}$

(b) $\{(x, y) | \, y = 2x^2\}$

2. Are the following functions one-to-one?

(a) $\{(1, 2), (2, 3), (4, 4)\}$

(b) $\{(x, y) | \, y = x^2 + 1\}$

3. Find the inverse function.

$f(x) = 2x - 9$

4. Find the inverse function.

$f(x) = \dfrac{x+2}{x}$

5. Find the ending balance in a savings account if the initial principal, \$12,000, was invested at a rate of 6%, compounded monthly, for 10 years.

$$A = P\left(1+\frac{r}{n}\right)^{nt}$$

6. Find the ending balance in a savings account if the initial principal, \$12,000, was invested at a rate of 6%, compounded continuously, for 10 years.

$$A = Pe^{rt}$$

7. Solve.

$$25^{4x} = 5$$

8. Solve.

$$16^{x+1} = 8$$

9. Solve.

$$9^{x+2} = 3^{x-1}$$

10. Solve.

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

11. The population of aphids in a rose plant is given by the following formula:

$$P = 80e^{0.17t}$$

where t is time (in weeks) since the plant was inspected. Find the aphid population at 2 weeks (to the nearest whole number).

12. What amount should be invested at 4% compounded continuously in order to have an accumulated savings of $50,000 in 18 years?

13. Write the exponential equations in logarithmic form (a) $3^4 = 81$ (b) $12^0 = 1$	**14**. Write the following logarithmic equations in exponential form (a) $\log_5(125) = 3$ (b) $\ln(5) = x$
15. Evaluate (a) $\log_5(625)$ (b) $\ln e$	**16.** Use a calculator to evaluate the following. Round your answers to the nearest hundredth (x.xx) (a) $\log(4.5)$ (b) $\ln(4.5)$

17. Use the properties of logarithms to rewrite the expression as logarithms of single variables or numbers. Simplify if possible.

$$\log_m\left(\frac{5^2}{m}\right)$$

18. Use the properties of logarithms to rewrite the expression as a single logarithm.

$$\frac{1}{2}\log_m(5) + 3\log_m(x)$$

19. Solve

(a) $5^x = 10$

(b) $e^x = 10$

20. Solve

$$\log_3(x) + \log_3(x-2) = \log_3(15)$$

A ***function*** is a relation in which in which each x-value is paired with exactly one y-value.

***One-to-one function*:** A function in which each x-value corresponds to exactly one y-value and each y-value corresponds to exactly one x-value.

Property for Solving an Exponential Equation
If $a^x = a^k$, then $x = k$ (for $a > 0$ and $a \neq 1$).

Rules for Exponents	
Product Rule	$a^m \cdot a^n = a^{m+n}$
Quotient Rule	$\frac{a^m}{a^n} = a^{m-n}$ $(a \neq 0)$
Power Rules	$(a^m)^n = a^{mn}$ $(ab)^m = a^m b^m$ $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$ $(b \neq 0)$
Zero Exponent	$a^0 = 1$ $(a \neq 0)$
Negative Exponent	$a^{-n} = \frac{1}{a^n}$ $(a \neq 0)$
Rational Exponent	$a^{\frac{m}{n}} = \sqrt[n]{a^m}$ ($a \geq 0$ when n is even)

Properties of Logarithms	
If x, y, and b are positive real numbers, where $b \neq 1$, and r is any real number, then the following are true:	
Definition	$\log_b x = y \Leftrightarrow b^y = x$ ($x > 0$, $b > 0$ and $b \neq 1$)
Basic Properties	$\log_b b = 1$ and $\log_b 1 = 0$
Product Rule	$\log_b xy = \log_b x + \log_b y$
Quotient Rule	$\log_b \frac{x}{y} = \log_b x - \log_b y$
Power Rule	$\log_b x^r = r \log_b x$
Special Properties	$b^{\log_b x} = x$ and $\log_b b^x = x$
Logarithm Property of Equality	$\log_b x = \log_b y \Leftrightarrow x = y$ ($x > 0$, $y > 0$, $b > 0$ and $b \neq 1$)