Name ________________________________ ______ raw ______ scaled ______ percent

Math 11 Trimester 1 Exam 1 (319 Points)
N^{th}roots, functions, exponential equations

- **Partial credit may be given for correct work. Therefore, it is to your advantage to write clear solutions. If I cannot understand a solution within 90 seconds, then it will receive no partial credit.**

- **Answers must be completely simplified. No denominators may include radicals. All fractions reduced. Arithmetic must be completely performed; e.g. write 9 instead of $\sqrt{81}$.**

- **No calculators. All answers must be exact.**

- **A. Simplify the following. (5 points each answer)**

[1] $\sqrt[5]{4}\,\sqrt[5]{8}$

[2] $\sqrt[3]{27^2}$

[3] $\sqrt[5]{2}\,\sqrt[3]{2}\,\sqrt{2}$

■ **B. Simplify the following. (5 points each answer)**

[1] $\left(a^{\frac{5}{12}} a^{\frac{1}{2}}\right)^{\frac{12}{11}}$

[2] $\left(a^{\sqrt{2}}\right)^{-\pi} \cdot a^{\sqrt{2\pi^2}}$

[3] $\left(5^{\frac{1}{2}} \cdot 5^{-1}\right)^{-2} \cdot 5^{\frac{-3}{2}}$

■ **C. Answer the following. (6 points each answer)**

[1] Suppose $P(-\pi, 3)$ and Q are symmetric with respect to the x-axis. Then Q is the point (,)

[2] Suppose $P(-3, -9)$ and Q are symmetric with respect to the y-axis. Then Q is the point (,)

[3] Let $P(\pi, 7)$ and Q be symmetric with respect to the line $y = x$. Then Q is the point (,)

[4] (Circle the best answer.) The graph of $f(x) = 2^x$ is symmetric with respect to the

(a) the x-axis.

(b) the y-axis.

(c) the line $y = x$.

(e) a, b, and c

(f) a and b only

(g) none of the above.

[5] (Circle the best answer.) The graph of $f(x) = x^3$, $x \in (0, \infty +)$ is symmetric to

(a) $g(x) = -x^3$, $x \in (0, \infty +)$ with respect to the x-axis.

(b) $h(x) = -x^3$, $x \in (-\infty, 0)$ with respect to the y-axis.

(c) $j(x) = x^3$, $\in (-\infty, 0)$, with respect to the origin.

(d) all of the above

(e) a and c only

(f) none of the above.

■ D1. True or False. Check [T] or [F]. (13 points each answer)

[1] If n is an even number, $f : f(x) = x^n$ is an increasing function of x on the interval

[T] [F] $(-\infty, 0)$

[T] [F] $(0, \infty +)$

[T] [F] $(-\infty, \infty +)$

[2] If n is an odd number, $f : f(x) = x^n$ is an increasing function of x on the interval

[T] [F] $(-\infty, 0)$

[T] [F] $(0, \infty +)$

[T] [F] $(-\infty, \infty +)$

■ **D2. Answer the following. (13 points each answer)**

[1] If n is an even number, state three points on the graph of $f : f(x) = x^n$.

[2] If n is an odd number, state the three points on the graph of $f : f(x) = x^n$.

[3] Write all solutions of the simultaneous equations $y = x^{16}$ and $y = x^{17}$.

■ **E. Answer the following. (16 points each answer - (a) and (b) 8 points each)**

[1] Let $f : f(x) = ax^2$ and $g : g(x) = bx^2$.

(a) Prove that the composition of f and g is not in general commutative.

(b) For what value(s) (other than zero) of a and b is the composition of f and g commutative.

[2] Let $f : f(x) = x^2$ and $g : g(x) = 2x$. Write $g \circ f$ in its simplest form.

[3] For $f : f(x) = x^{-2}$, $x \neq 0$, evaluate $(f \circ f \circ f)(x)$ at $x = 2$.

[4] Let $f : f(x) = x^2 + 2x + 3$ and $g : g(x) = \sqrt{x}$. Evaluate $f(g(x))$ at $x = 9$.

[5] Find functions f and g such that $f \circ g = h$, for $h : h(x) = (3x^2 + x - 2)^{\frac{1}{5}}$.

[6] State the domain and range of the function f defined by $f(x) = \frac{1}{\sqrt{x-3}}$.

■ **F. Find the inverse of each function and state its domain. (13 points each answer)**

[1] $f : f(x) = 2x - 5$

[2] $f : f(x) = \sqrt{x}, \ x \in [0, \infty)$

[3] $g : g(x) = \frac{1+x}{3-x}$.

■ **G. Solve the following. (11 points each answer)**

[1] $10^{x+1}(100^{2-x}) = \frac{1}{1000}$

[2] $7^{x^2} = \frac{1}{49^{6-2x}}$

[3] $3(2^{x+1}) - 8 = 5(2^x)$

■ **H. Answer the following. (13 points each answer)**

[1] Prove that $f : f(x) = x^2 + 2,\ x \geq 2$ is the inverse function of $g : g(x) = \sqrt{x-2},\ x \geq 2$.

[2] Prove that the function defined by $g : g(x) = x^n,\ n \in \{1, 3, 5, 7, \ldots\}$ is a 1-1 function.