Date Completed: _____
Mentor Initials: _____

A mentor can change everything.

Exponents and Radicals (Advanced)

Multiple Choice

1. For all positive m and n, $m^{\frac{4}{3}}n^{\frac{1}{4}}$ can be written in which of the following radical forms?

A) $\sqrt[12]{m^4n}$

B) $\sqrt[12]{m^4n^3}$

C) $\sqrt[12]{m^4n^4}$

D) $m\sqrt[12]{m^4n^3}$

2. For all positive x, which of the following expressions is equivalent to $\sqrt[6]{x^5}(\sqrt[3]{x^5})$?

A) $x^{\frac{9}{10}}$

B) $x^{\frac{5}{2}}$

C) $x^{\frac{10}{9}}$

D) $x^{\frac{9}{5}}$

3. If $s > 0$ and $t > 0$, $\sqrt{\frac{s}{t}} + \sqrt{\frac{t}{s}}$ is equivalent to which of the following?

A) 1

B) $\frac{s+t}{st}$

C) $\frac{s+t}{\sqrt{st}}$

D) $\frac{2\sqrt{ts}}{t+s}$

4. If c and x are positive rational integers such that $c^{3x} = 4$, then $c^{9x} = ?$

A) 8
B) 12
C) 16
D) 64

5. For all $y > 0$, which of the following expressions is NOT equivalent to $\sqrt[3]{\sqrt[2]{y^3}}$?

A) $\sqrt{y}$

B) $\sqrt[4]{y^2}$

C) $\sqrt{\sqrt[3]{y^3}}$

D) $y^{\frac{1}{3}}$

6. For how many integers x is the equation $9^{3x+6} = 27^{2x+4}$ true?

A) 0
B) 1
C) 2
D) An infinite number

7. The expression $\frac{x^{-3}y^{\frac{1}{2}}}{x^{\frac{1}{2}}y^{-1}}$, where $x > 1$ and $y > 1$, is equivalent to which of the following?

A) $\frac{(\sqrt[3]{x})(y\sqrt{y})}{\sqrt{x}}$

B) $\frac{y\sqrt{y}}{x^3\sqrt{x}}$

C) $\frac{x^3\sqrt{x}}{y\sqrt{y}}$

D) $\frac{(\sqrt[3]{x})(\sqrt{y})}{y\sqrt{x}}$

8. $(\sqrt[m]{2})3^{\frac{2}{m}}$

If m is a positive integer, which of the following is the equivalent to the expression above?

A) $2^{\frac{1}{m}}$
B) $6^{\frac{1}{m}}$
C) $\sqrt[m]{9}$
D) $\sqrt[m]{18}$

9. If $4y - 2x = 14$, what is the value of $\frac{16^y}{4^x}$?

A) 2^7
B) 2^{14}
C) 4^{14}
D) The value cannot be determined from the information given.

10. Let a and b be nonzero real numbers such that $3^{b+1} = 3a$. Which of the following is an expression for 3^{b+3} in terms of a?

A) $\frac{1}{9a^3}$
B) $\frac{1}{6a}$
C) 27a
D) $6a^2$

Grid-In

11. For a positive real number z, where $z^6 = 3$, what is the value of z^{18} ?

12. If $\frac{\sqrt{y^5}}{\sqrt[3]{y^2}} = y^{\frac{j}{k}}$ for all positive values of y, what is the value of $\frac{j}{k}$?

13. If $\frac{x^{c^2}}{x^{d^2}} = x^{20}$, $x > 1$, and $c - d = 5$, what is the value of $c + d$?

14. Two numbers, g and h, are each greater than zero, and the square root of g is equal to the cube root of h. For what value of x is g^{3x-2} equal to h ?

15. Whenever l and m are positive integers such that $(\sqrt[3]{5})^l = 125^m$, what is the value of $\frac{l}{m}$?