Name________________________

BLC190- ATF-Sp2019

Homework 3: Exponents and Roots

1. Composite Functions: [These answers are very simple.]

Given: $f(x) = x - 2$ $g(x) = x + 2$

a. Find $f(g(x))$

Given: $f(x) = x^2$ $g(x) = x^{1/2}$

b. Find $g(f(x))$

2. Simplify the following... [There is a consistency to the answers.]

a. $\dfrac{t^6 r^9}{(tr)^6 (r^3)}$	b. $\dfrac{\left(x^{1/3}\right)^2}{x^{4/6}}$	c. $\dfrac{x^5 \left(x^2 y^4\right)^5}{x^{15} y^{20}}$
d. $\dfrac{\left[\sqrt{(x^3 y^4)}\right]^3}{\left(x^{3/2}\right)^3 (y^6)}$	e. $\left\{\dfrac{\left(x^3 y^4\right)^{0.5}}{y(x^{1.5})(y)}\right\}^{\pi}$	f. $\left\{\dfrac{\pi^6 e^9 r^{\pi}}{(\pi e)^6 (e^3)} (az)^{0.43}\right\}^0$

3. Evaluate the following: [3a and 3b share the same answer.]

a. $\dfrac{\left(\sqrt{243}\right)^{1/5}}{\sqrt[3]{27}(0.5)} \cdot \sqrt{3} =$	b. $\dfrac{\left(\sqrt[3]{117649}\right)(7^{-2})}{\frac{e^0}{2}} =$

4. Ballpark the following: Don't use a calculator. Just use your head ... and a pencil.

E.g. $3^{2.5} = 3^2 \cdot 3^{0.5} = 3^2 \cdot \sqrt{3} \approx 9 \cdot 1.7 = 15.3$. This is good practice.

E.g.x: $2^{1.5} = 2 \cdot 2^{0.5} =$ Obiously between 2 and 4. $2^{1.5} = 2\sqrt{2}$ $\sqrt{2} \approx 1.4$ $2^{1.5} = 2\sqrt{2} \cong 2 \cdot 1.4 = \mathbf{2.8}$	E.g.y: $2^{2.5} = 2 \cdot 2 \cdot 2^{0.5} =$ Obviously between 4 and 8 $2^{2.5}$ will be twice as large as $2^{1.5}$. $2^{2.5} = 2 \cdot 2 \cdot 1.4 = \mathbf{5.6}$	E.g.z: $2^{2.75} =$ Obviously between 5.6 and 8. $= 2 \cdot 2 \cdot \sqrt{2} \cdot \sqrt[4]{2}$ $\cong 4 \cdot 1.4 \cdot 1.2 \approx \mathbf{6.7}$
a. $9^{2.5} =$ Obviously between 81 and _____	b. $81^{1.25} =$ Obviously between 81 and _____	c. $243^{0.2} =$ Obviously between 1 and _____
d. $16^{1.5} =$ Obviously between 16 and _____	e. $16^{1.75}$ Obviously between 64 and _____	f. $16^{-1.6} =$ Obviously between 1/64 and _____

5. Evaluate using a calculator. Give answers to 5 decimal places.

a. $\frac{1+\sqrt{5}}{2} =$	b. $\left(\frac{1+\sqrt{5}}{2}\right)^{-1} =$	c. $\frac{1+\sqrt{5}}{2} - 1 =$

d. I imagine you noticed something interesting in the above 3 problems (problem number 5). Will any other number in place of $\sqrt{5}$ yield the same property shown in a, b, and c above? Try 3 different numbers (in all three situations) and then comment on what you discover. What is special about the problems from a, b, and c? Feel free to do a little research on these equations and report on what you find out.

New number choice #1: x =	New number choice #2: y =	New number choice #3: z =
a_x: $\frac{1+x}{2} =$	a_y: $\frac{1+y}{2} =$	a_z: $\frac{1+z}{2} =$
b_x: $\left(\frac{1+x}{2}\right)^{-1} =$	b_y: $\left(\frac{1+y}{2}\right)^{-1} =$	b_z: $\left(\frac{1+z}{2}\right)^{-1} =$
c_x: $\frac{1+x}{2} - 1 =$	c_y: $\frac{1+y}{2} - 1 =$	c_z: $\frac{1+z}{2} - 1 =$

Comment on what you notice:

6. Solve for the variable: [There is a pattern to the answers.]

a. $\frac{1}{x^3} = \frac{1}{8}$	b. $x^{-5} = \frac{1}{32}$	c. $\frac{x^{221}}{x^{223}} = \frac{1}{4}$
c. $(x^2)^{-3} = 0.04$	d. $(x^{0.5})^3 = 125$	e. $\left(100^{-1/2}\right)\left(\frac{1}{x^{-1/2}}\right)^3 = 12.5$
f. $\pi\sqrt{x} = \sqrt{x^3}$	g. $\frac{\pi^2}{x^{-2}} = \frac{x^3}{\pi^{-1}}$	h. $x^{2.5} = \frac{31.04373177842557}{\sqrt{x}}$

7. Now try this. Solve the following for y: $220 = 10^y$ If you can't figure it out... estimate an answer.

Hint: $220 = 10^2 \cdot 10^?$

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8. Now it is your turn to make up some problems. Make up 3 problems in the style of number 2 or 3 in which the all three answers are the same number. Make the problems look different from each other. Don't use the exact same tricks for each problem. Make the answer something simple and elegant... not some random multi-digit monstrosity.

8a.	8b.	8c.

Exponents: Need to know properties.

[for $x, y, a\ and\ b\ \mathbb{R}eal\ Numbers$ (additional limitations apply)]

$a^x a^y = a^{x+y}$	$(ab)^x = a^x b^x$	$\sqrt[x]{a} = a^{1/x}$
$\dfrac{a^x}{a^y} = a^{x-y}$	$\left(\dfrac{a}{b}\right)^x = \dfrac{a^x}{b^x}$	$\dfrac{1}{a^x} = a^{-x}$
$(a^x)^y = a^{xy}$	$a^0 = 1$	$\dfrac{1}{a^{-x}} = a^x$