Name Schlansky
Mr. Schlansky

Date _____
Pre Calculus

Unit 5: Exponents and Logarithms Review Sheet

1. Justify why $\frac{\sqrt[3]{x^2y^5}}{\sqrt[4]{x^3y^4}}$ is equivalent to $x^{\frac{-1}{12}}y^{\frac{2}{3}}$ using properties of rational exponents, where $x \neq 0$ and $y \neq 0$.

$\frac{(x^2y^5)^{\frac{1}{3}}}{(x^3y^4)^{\frac{1}{4}}}$ $\quad \frac{x^{\frac{2}{3}}y^{\frac{5}{3}}}{x^{\frac{3}{4}}y^{1}}$ $\quad x^{-\frac{1}{12}}y^{\frac{2}{3}}$

Radicals are fractional exponents

Get rid of parentheses

Negative exponents are fractions

Clean it up: multiply, divide/reduce, evaluate

(4) $\frac{2}{3} - \frac{3(3)}{4(3)}$
$\frac{8}{12} - \frac{9}{12} = -\frac{1}{12}$

(4) $\frac{1(4)}{4} - \frac{5}{3} - \frac{1(3)}{3}$
$\frac{4}{4} - \frac{5}{3} - \frac{3}{3} = -\frac{2}{3}$

2. For n and $p > 0$, is the expression $\left(p^2n^{\frac{1}{2}}\right)^8\sqrt{p^5n^4}$ equivalent to $p^{18}n^6\sqrt{p}$? Justify your answer.

$(p^2n^{\frac{1}{2}})^8(p^5n^4)^{\frac{1}{2}} = p^{18}n^6p^{\frac{1}{2}}$

$p^{16}n^4p^{\frac{5}{2}}n^2 = p^{18}n^6p^{\frac{1}{2}}$

$p^{\frac{37}{2}}n^6 = p^{\frac{37}{2}}n^6$ yes!

(2) $\frac{16}{1} + \frac{5}{2}$
$\frac{32}{2} + \frac{5}{2} = \frac{37}{2}$

(2) $\frac{18}{1} + \frac{1}{2}$
$\frac{36}{2} + \frac{1}{2} = \frac{37}{2}$

Solve the following equations for all values of x reciprocal power

3. $3x^{\frac{2}{5}} - 11 = 289$
$+11 \quad +11$

$\frac{3x^{\frac{2}{5}}}{3} = \frac{300}{3}$

$(x^{\frac{2}{5}})^{5/2} = (100)^{5/2}$

$x = 100000$

4. $2x^{\frac{1}{5}} - 2 = -8$
$+2 \quad +2$

$\frac{2x^{\frac{1}{5}}}{2} = \frac{-6}{2}$

$(x^{\frac{1}{5}})^5 = (-3)^5$

$x = -243$

common exponential base

Solve the following equations for all values of x

5. $27^x = 9^{x+2}$

$(3^3)^x = (3^2)^{x+2}$ → $x = 4$

$3^{3x} = 3^{2x+4}$

$3x = 2x + 4$

$-2x \quad -2x$

6. $64^{x-2} = 256^{2x}$

$(2^6)^{x-2} = (2^8)^{2x}$

$6(x-2) = 8(2x)$

$6x - 12 = 16x$

$-6x \quad -6x$

$\frac{-12}{10} = \frac{10x}{10}$

$-\frac{6}{5} = x$

Expand the following logarithms

7. $\ln\frac{\sqrt{x}}{y^3}$

$\ln x^{\frac{1}{2}} - \ln y^3$

$\ln\frac{x^{\frac{1}{2}}}{y^3}$

$\frac{1}{2}\ln x - 3\ln y$

8. $\log\frac{m^3\sqrt{n}}{k^2}$

$\log m^3 + \log n^{\frac{1}{2}} - \log k^2$

$3\log m + \frac{1}{2}\log n - 2\log k$

$\log\frac{m^3 n^{\frac{1}{2}}}{k^2}$

9. The expression $\frac{1}{2}\log m - 3\log n$ is equivalent to

$\log\frac{m^{\frac{1}{2}}}{n^3}$

(1) $\log\sqrt{m} + \log n^3$

(2) $\log\frac{1}{2}m - 3\log n$

(3) $\log\frac{m^2}{3\sqrt{n}}$

(4) $\log\frac{\sqrt{m}}{n^3}$

10. If $\log_b x = 3\log_b p - \left[2\log_b t + \frac{1}{2}\log_b r\right]$, then the value of x is

1) $\frac{p^3}{\sqrt{t^2 r}}$

2) $p^3 t^2 r^{\frac{1}{2}}$

3) $\frac{p^3 t^2}{\sqrt{r}}$

4) $\frac{p^3}{t^2\sqrt{r}}$

$\log_b \frac{p^3}{t^2 r^{\frac{1}{2}}}$

Solve the following equations

exponential form

11. $\log_{16}(p^2-p+4)-\log_{16}(2p+11)=\frac{3}{4}$

$\log_{16}\frac{p^2-p+4}{2p+11}=\frac{3}{4}$

$16^{\frac{3}{4}}=\frac{p^2-p+4}{2p+11}$

$(2p+11)(8)=\left(\frac{p^2-p+4}{2p+11}\right)(2p+11)$

$16p+88=p^2-p+4$

$-16p-88 \quad -16p-88$

$0=p^2-17p-84$

$0=(p-21)(p+4)$

$p=21 \quad p=-4$

cancel logs

12. $\log_{(x+3)}(2x+3)+\log_{(x+3)}(x+5)=2$

$\log_{(x+3)}(2x+3)(x+5)=2$

$(x+3)^2=(2x+3)(x+5)$

$(x+3)(x+3)=(2x+3)(x+5)$

$x^2+3x+3x+9=2x^2+10x+3x+15$

$x^2+6x+9=2x^2+13x+15$

$-x^2-6x-9 \quad -x^2-6x-9$

$0=x^2+7x+6$

$0=(x+6)(x+1)$

$x=-6 \quad x=-1$ ✓

13. $\log(x-6)-\log(3)=\log 6$

$\log\frac{x-6}{3}=\log 6$

$3\left(\frac{x-6}{3}\right)=(6)3$

$x-6=18$

$+6 \quad +6$

$x=24$

log both sides

14. $\log_8(x-40)-\log_8(x-10)=\log_8(x+2)$

$\log_8\frac{(x-40)}{(x-10)}=\log_8(x+2)$

$(x-10)\left(\frac{x-40}{x-10}\right)=(x+2)(x-10)$

$x-40=x^2-10x+2x-20$

$x-40=x^2-8x-20$

$-x+40 \quad -x+40$

$0=x^2-9x+20$

$0=(x-5)(x-4)$

$x=5 \quad x=4$

No Solution

15. $8+2(4)^{-5x}=14$

$-8 \quad -8$

$\frac{2(4)^{-5x}}{2}=\frac{6}{2}$

$\log 4^{-5x}=\log 3$

$-5x\log 4=\log 3$

$\frac{-5x\log 4}{-5\log 4}=\frac{\log 3}{-5\log 4}$

$x=-.2$

16. $256+3(2)^{6x}=2700$

$-256 \quad -256$

$\frac{3(2)^{6x}}{3}=\frac{2444}{3}$

$\log 2^{6x}=\log 814.6$

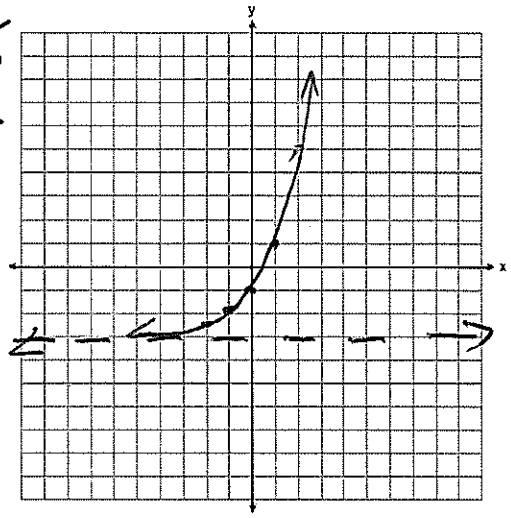
$\frac{6x\log 2}{6\log 2}=\frac{\log 814.6}{6\log 2}$

$x=1.6$

Graph the following equations on the grid provided

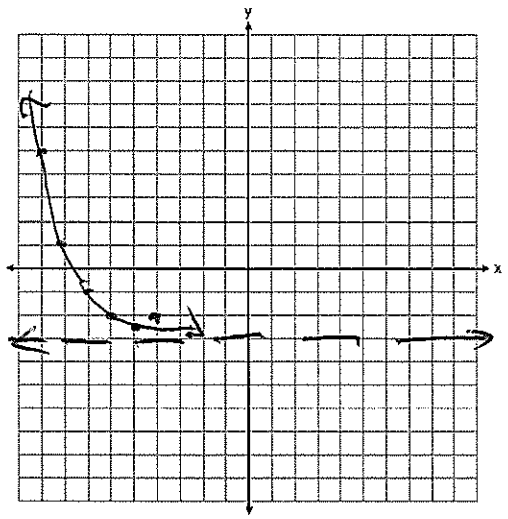
17. $y = 2^{x+1} - 3$ asymptote: $y = -3$

x	y
-2	-2.5
-1	-2
0	-1
1	1
2	5



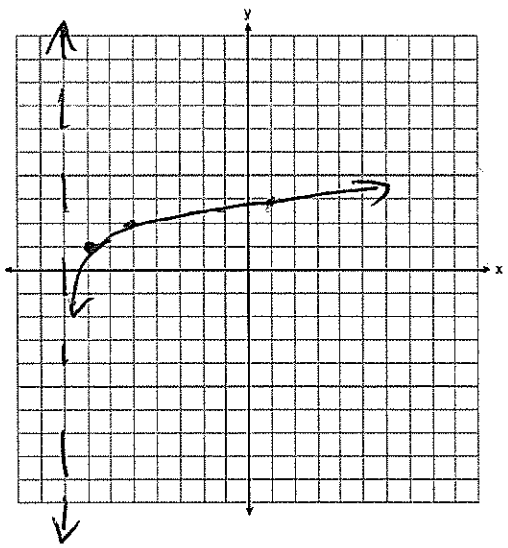
18. $y = \left(\frac{1}{2}\right)^{x+6} - 3$ asymptote: $y = -3$

x	y
-9	5
-8	1
-7	-1
-6	-2
-5	-2.5



19. $y = \log_3(x+8) + 1$ asymptote: $x = -8$

x	y
-8	E
-7	1
-5	2
1	3



20. $y = \log_2(x+9) - 3$ asymptote: $x = -9$

x	y
-9	E
-8	-3
-7	-2
-5	-1
-1	0
7	1