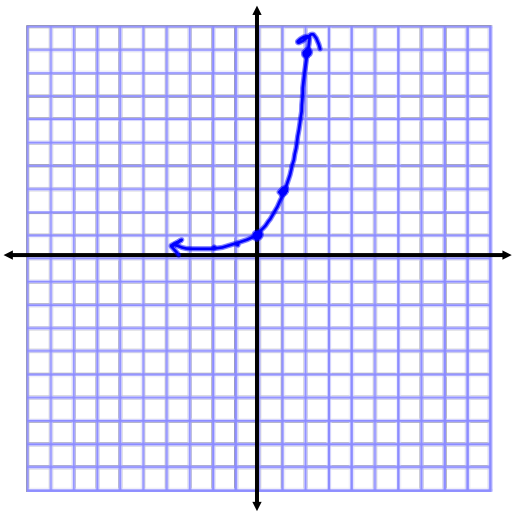
9.1 - I will graph, simplify, and solve exponential equations

Graph the exponential equations
State its domain, range and type of graph

$y = 3^x$

X	Y	
0	$y = 3^0 = 1$	$(0, 1)$
1	$3^1 = 3$	$(1, 3)$
2	$3^2 = 9$	$(2, 9)$
-1	$3^{-1} = \frac{1}{3^1}$	$(-1, 1/3)$
-2	$3^{-2} = \frac{1}{3^2} = \frac{1}{9}$	$(-2, 1/9)$



domain: $(-\infty, \infty)$ any real #
range: $(0, \infty)$
graph is : increasing

graph

$y = 2(4)^{1-x}$

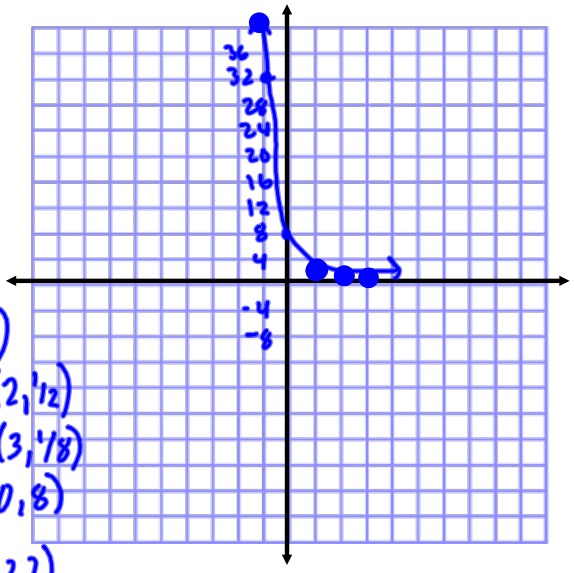
$1 - x = 0$

$-1 \quad -1$

$-x = -1$

$x = 1$

X	Y
1	$2(4)^{1-1} = 2(4)^0 = 2$ (1, 2)
2	$2(4)^{1-2} = 2(4)^{-1} = \frac{2}{4} = \frac{1}{2}$ (2, 1/2)
3	$2(4)^{1-3} = 2(4)^{-2} = \frac{2}{4^2} = \frac{1}{8}$ (3, 1/8)
0	$2(4)^{1-0} = 2(4)^1 = 8$ (0, 8)
-1	$2(4)^{1-(-1)} = 2(4)^2 = 32$ (-1, 32)



domain: $(-\infty, \infty)$

range: $(0, \infty)$

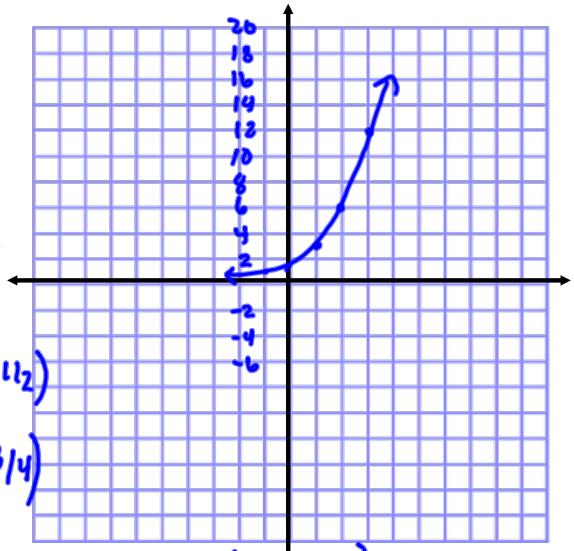
graph is : decreasing

$y = 3(2)^{x-1}$

$x - 1 = 0$

$x = 1$

X	Y
1	$3(2)^{1-1} = 3(2)^0 = 3$ (1, 3)
2	$3(2)^{2-1} = 3(2)^1 = 6$ (2, 6)
3	$3(2)^{3-1} = 3(2)^2 = 12$ (3, 12)
0	$3(2)^{0-1} = 3(2)^{-1} = \frac{3}{2} = 1\frac{1}{2}$ (0, 1 1/2)
-1	$3(2)^{-1-1} = 3(2)^{-2} = \frac{3}{2^2} = \frac{3}{4}$ (-1, 3/4)



domain: $(-\infty, \infty)$

range: $(0, \infty)$

graph: increasing

simplify the exponentials

$x^2 \cdot x^3 = x^5$ (add exponents)

$(x^2)^3 = x^6$ (mult. exponents)

$\sqrt[2]{x^1} = x^{1/2}$ power / index #

$\sqrt[4]{x^3} = x^{3/4}$

$x^2 \cdot x^{-5} = x^{-3} = \frac{1}{x^3}$

$(2x^3)^4$ $16x^{12}$

$\frac{2x^5}{4x} = \frac{1x^4}{2}$ (subtract exp)

$x^{1/2} = \sqrt[2]{x^1}$ power / index #

$x^{2/3} = \sqrt[3]{x^2}$

$\left(3^{\sqrt{2}}\right)^{\sqrt{8}} = 3^{\sqrt{16}} = 3^4 = 81$

$5^{\sqrt{2}} \cdot 5^{\sqrt{8}} = 5^{\sqrt{2}+\sqrt{8}} = 5^{\sqrt{2}+2\sqrt{2}} = 5^{3\sqrt{2}}$

$8^x \cdot 16^{3x} = 2^{3x} \cdot 2^{4\cdot 3x} = 2^{3x} \cdot 2^{12x} = 2^{15x}$

need same base

$8^{\sqrt{5}} \div 2^{\sqrt{75}} = 2^{3\sqrt{5}} \div 2^{5\sqrt{3}} = 2^{3\sqrt{5}-5\sqrt{3}}$

need same base

Solve and check.

To solve: need same bases

$5^x = 5^8$

$x = 8$

check:

$5^8 = 5^8$ ✓

$3^x = 9$

$3^x = 3^2$

$x = 2$

$7^{6x} = 7^{2x-20}$

$6x = 2x - 20$

$-2x \quad -2x$

$4x = -20$

$x = -5$

check:

$7^{6(-5)} = 7^{2(-5)-20}$

$7^{-30} = 7^{-30}$ ✓

$3^{6x-5} = 9^{4x-3}$

$3^{6x-5} = 3^{2(4x-3)}$

$6x-5 = 2(4x-3)$

$6x-5 = 8x-6$

$-6x \quad -6x$

$-5 = 2x-6$

$+6 \quad +6$

$1 = 2x$

$\frac{1}{2} = x$

$2^{x+1} = 32$

$2^{x+1} = 2^5$

$x+1 = 5$

$x = 4$

$7^{x+1} = 7^{3x-2}$

$x+1 = 3x-2$

$-x \quad +2 \quad -x \quad +2$

$3 = 2x$

$3/2 = x$

$25^{3x} = 125^{x-2}$

$5^{2(3x)} = 5^{3(x-2)}$

$6x = 3x-6$

$-3x \quad -3x$

$3x = -6$

$x = -2$

$$2^{3x-1} = \left(\frac{1}{8}\right)^{x}$$

$2^{3x-1} = \left(\frac{1}{2^3}\right)^{x}$

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

$3x-1 = -3x$

$-3x \quad -3x$

$-1 = -6x$

$1/6 = x$

$$5^{2x+3} = \sqrt[2]{5^{(x+4)}}$$

$5^{2x+3} = 5^{1/2(x+4)}$

$2x+3 = \frac{1}{2}x+2$

$-\frac{1}{2}x \quad -\frac{1}{2}x$

$\frac{3}{2}x+3 = 2$

$-3 \quad -3$

$\frac{3}{2}x = -1$

$x = -\frac{2}{3}$

pg. 528 #22, 40-56 ~~even~~ 4 (~~check 2~~)
change < to =