- Mrs. Tilus Name:_____

ssment Review-Exponential Functions

F-LE.A.2 - I can simplify expressions using the properties of exponents.

Simplify. Express your answer using only positive exponents.

1) $(4x^3)(-2x^4)(x^2)$

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

$= -8x^9$

2) $\left(\frac{n^{-3}}{n}\right)^{-2} \rightarrow \frac{n^6}{n^{-2}}$

$= n^6 \cdot n^2$

$= n^8$

3) $3x^{-2} \cdot (3x^2)^{-1}$

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

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

$= \frac{1}{x^4}$

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

$= x^{-6}y^{15}$

$= \frac{y^{15}}{x^6}$

5) $\left(\frac{10x^3y^5}{2x^4y^2}\right)^{-2}$ $\frac{10^{-2}x^{-6}y^{-10}}{2^{-2}x^{-8}y^{-4}}$

$= \frac{2^2x^8y^4}{10^2x^6y^{10}}$

$= \frac{4x^2}{100y^6}$

$= \frac{x^2}{25y^6}$

6) $\left(4x^3\right)^2\left(x^2y\right)^3\left(xy^4\right)$

$= 16x^6x^6y^3xy^4$

$= 16x^{6+6+1}y^{3+4}$

$= 16x^{13}y^7$

8.EE.A.9 – I can perform operations with numbers written in scientific notation.

Simplify. Express your answer in scientific notation.

7) $\frac{4\times10^3}{5\times10^6} \rightarrow \left(\frac{4}{5}\right) \times 10^{3-6}$

$= 0.8 \times 10^{-3-1}$

$= 8 \times 10^{-4}$

8) $\frac{(9.6\times10^7)}{(5.0\times10^3)}$ $\left(\frac{9.6}{5.0}\right) \times 10^{7-3}$

$= 1.92 \times 10^4$

9) $(2.8\times10^3)(4.0\times10^4)$

$= (2.8)(4) \times 10^{3+4}$

$= 11.2 \times 10^{7+1}$

$= 1.12 \times 10^8$

10) $(1.8\times10^{-3})(2.0\times10^{-4})$

$(1.8)(2) \times 10^{-3+(-4)}$

3.6×10^{-7}

11) $3.2\times10^{3+1} + 4.1\times10^4$

$0.32 + 4.1 \times 10^4$

4.42×10^4

12) $1.5\times10^{-2} - 5.2\times10^{-3+1}$

$1.5 - 0.52 \times 10^{-2}$

$0.98 \times 10^{-2-1}$

9.8×10^{-3}

Determine whether the sequence is a geometric sequence. If it is, identify the common ratio.

13) -2, 6, -18, 54, … Yes; $r=-3$

$r=\frac{6}{-2}=-3$, $r=\frac{-18}{6}=-3$

14) 1, 4, 9, 16, 25, … No;

$r=\frac{4}{1}=4$ $r=\frac{9}{4}=2.25$

15) 80, 40, 20, 10, … Yes; $r=\frac{1}{2}$

$r=\frac{40}{80}=\frac{1}{2}$ $r=\frac{20}{40}=\frac{1}{2}$

16) -1.5, -0.5, 0.5, 1.5, … No

$r=\frac{-0.5}{-1.5}=\frac{1}{3}$ $r=\frac{0.5}{-0.5}=-1$

17) $\frac{1}{8}, \frac{1}{2}$, 2, 8, 32, … Yes; $r=4$

$r=\frac{1}{2}\cdot\frac{8}{1}=\frac{8}{2}=4$ $r=\frac{2}{1}\cdot\frac{2}{1}=4$

18) 80, 60, 45, 33.75, … Yes; $r=\frac{3}{4}$

$r=\frac{60}{80}=\frac{3}{4}$ $r=\frac{45}{60}=\frac{3}{4}$

Use the formula to write the explicit formula for each geometric sequence. Formula→ $a_n = a_1 \cdot r^{n-1}$

19) -2, -12, -72, -432, …

$a_1=-2$ $r=\frac{-12}{-2}=6$

$a_n=-2(6)^{n-1}$

20) 1600, 400, 100, 25

$a_1=1600$, $r=\frac{400}{1600}\rightarrow\frac{1}{4}$

$a_n=1600\left(\frac{1}{4}\right)^{n-1}$

21) 4, -8, 16, -32, …

Determine if each equation is linear, quadratic or exponential. Explain your reasoning.

22) $y=5^x$ Exponential Fn (x in the exponent)

23) $f(x)=x^5$ Neither (x to the 5th)

24) $y=3$ Linear

25) $m(x)=-2\cdot 3^{x-1}$ Exponential Fn (x in the exponent)

26) $h(x)=2x^2$ Quadratic Fn (x to the 2nd)

HSF-LE.A.2 - I can construct an exponential function from a table, a graph, or a description.

Write an equation for each function.

27)

x	y
-1	2
0	8
1	32

$y=8\cdot 4^x$

$32=a\cdot b^1$

$8=a\cdot b^0 \rightarrow 8=a(4)^0$

$4=b$ $8=a$

28)

x	y
1	½
2	3
3	18

$y=\left(\frac{1}{12}\right)6^x$

$18=a\cdot b^3$

$3=a\cdot b^2$

$6=b$

$3=a(6)^2$

$\frac{3}{36}=\frac{36a}{36}$ $a=\frac{1}{12}$

29)

x	y
2	24
3	8
4	8/3

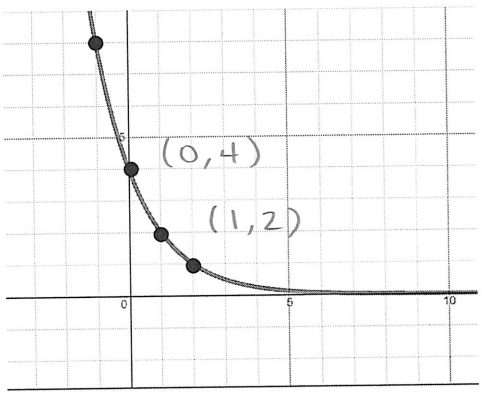
$y=216\left(\frac{1}{3}\right)^x$

$\frac{8=a\cdot b^3}{24=ab^2} \rightarrow 24=a\left(\frac{1}{3}\right)^2$

$\frac{24}{1/9}=\frac{a\left(\frac{1}{9}\right)}{1/9}$

$\frac{1}{3}=b$ $a=216$

30)



$2=a\cdot b^1$

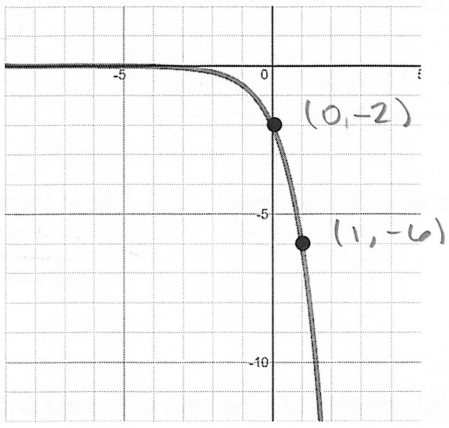
$4=a\cdot b^0 \rightarrow a=4$

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

$y=4\left(\frac{1}{2}\right)^x$

Write an equation for each function.

31)



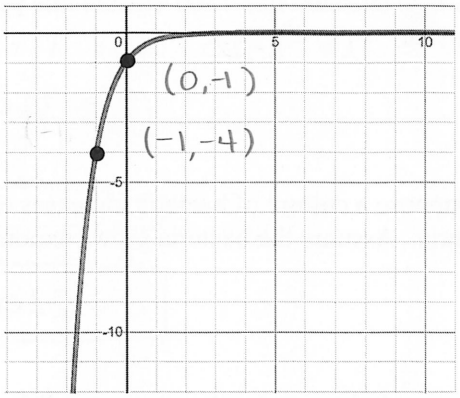
$-6 = a \cdot b^1$

$-2 = a b^0 \rightarrow -2 = a(3)^0$

$3 = b$ $\quad -2 = a$

$y = -2(3)^x$

32)



$-1 = a \cdot b^0 \rightarrow -1 = a(\frac{1}{4})^0$

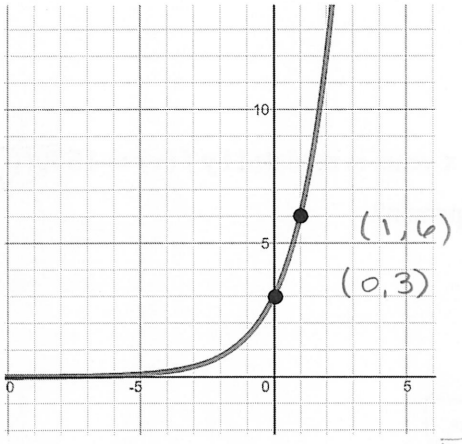
$-4 = a \cdot b^{-1}$

$-1 = a$

$\frac{1}{4} = b$

$y = -1 \cdot (\frac{1}{4})^x$

33)



$6 = a \cdot b^1$

$3 = a b^0 \rightarrow 3 = a(2)^0$

$2 = b$ $\quad 3 = a$

$y = 3(2)^x$

34) Passes through (5, 96) and (6, 192)

$192 = a \cdot b^6$

$96 = a \cdot b^5 \rightarrow 96 = a(2)^5$

$2 = b$

$\frac{96}{32} = \frac{32a}{32}$

$3 = a$

$y = 3(2)^x$

35) Passes through (1, 4) and (3, 36)

$36 = a \cdot b^3$

$4 = a \cdot b^1 \rightarrow 4 = a(3)^1$

$\sqrt{9} = \sqrt{b^2}$ $\quad \frac{4}{3} = \frac{3a}{3}$

$3 = b$ $\quad \frac{4}{3} = a$

$y = \frac{4}{3}(3)^x$

36) Passes through (3, 20) and (5, 5)

$5 = a \cdot b^5$

$20 = a \cdot b^3$

$\sqrt{\frac{1}{4}} = \sqrt{b^2}$

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

$20 = a(\frac{1}{2})^3$

$\frac{20}{1/8} = \frac{\frac{1}{8}a}{1/8}$

$160 = a$

$y = 160(\frac{1}{2})^x$

Write an equation for each function.

37) A new museum had 7500 visitors this year. The museum curators expect the number of visitors to grow by 5% each year. $a = 7{,}500$ $b = 1 + 0.05$ $b = 1.05$ $y = 7{,}500(1.05)^x$

38) Suppose a culture of bacteria increases each hour. Initially there are 2200 bacteria. After 1 hour there are 4400 bacteria. Assume the bacteria grows exponentially. a $b = \frac{4400}{2200}$ $b = 2$ $y = 2200(2)^x$

39) A population of amoebas in a petri dish will triple in size every 20 minutes. At the start of the experiment there are 800 amoebas. Let x be the number of 20 minute intervals. $y = 800(3)^x$

40) A single elimination tournament starts with 128 teams. Each round half of the remaining teams are eliminated. $y = 128\left(\frac{1}{2}\right)^x$

Use the exponential function to answer the following question.

41) The average pounds of garbage a person throws out each year after x years is modeled by $f(x) = 1500(0.98)^x$

a.) What was the initial average pounds of garbage thrown out per person?

$f(0) = 1500$ lbs

b.) What is the percent of reduction in garbage each year?

$1 - x = .98$ $(-x = -0.02)$

$x = 0.02 \rightarrow 2\%$

c.) What is the predicted average amount of garbage in 5 years?

$f(5) = 1500(0.98)^5$

$f(5) = 1{,}356$ lbs

42.) The value of an investment is modeled by $f(x) = 5000 \cdot 2^x$, where x is the number of decades.

a.) What was the value of the initial investment?

$f(0) = \$5{,}000$

b.) What is the growth rate of the investment?

$1 + x = 2$ $x = 1 \rightarrow 100\%$

c.) What is the value of the investment after 30 years?

$f(3) = \$40{,}000$