AFM Unit 3 Exponentials and Logs
Exponential Practice

Name: Key

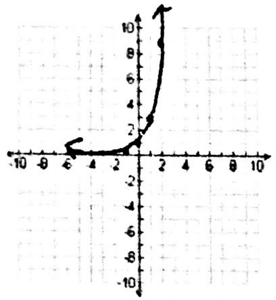
Linear and quadratic parent functions are unique. However, there are two types of parent functions for exponential - **growth and decay**.

$$y = ab^x$$

Exponential growth function the growth factor, b, is always $b > 1$
Exponential decay the decay factor, b, is always $0 < b < 1$

1) Exponential growth parent function $f(x) = 3^x$

x	-1	0	1	2	3
y	1/3	1	3	9	27



a. What shape is the graph?
exponential growth

b. Where does it cross the y-axis?
(0, 1)

c. Where does it cross the x-axis?
does not cross xaxis

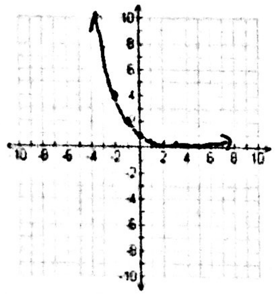
d. What is the Domain?
$(-\infty, \infty)$

e. What is the Range? $(0, \infty)$

f. As the independent variable increases, the dependent variable increases.

2) Exponential Decay Parent Function $f(x) = \left(\frac{1}{2}\right)^x$

x	-1	0	1	2	3
y	2	1	1/2	1/4	1/8



a. What shape is the graph?
exponential decay

b. Where does it cross the y-axis?
(0, 1)

c. Where does it cross the x-axis?
does not cross xaxis

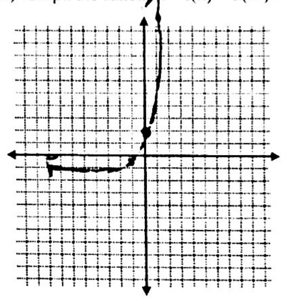
d. What is the Domain?
$(-\infty, \infty)$

e. What is the Range? $(0, \infty)$

f. As the independent variable increases, the dependent variable decreases.

Graphs of exponential functions: $y = ab^x$

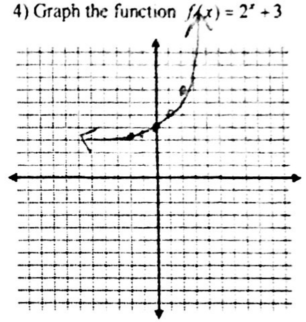
3) Graph the function $f(x) = 3(4^x) - 1$



x	-1	0	1
y	-1/4	2	11

Describe the transformation:
down 1

4) Graph the function $f(x) = 2^x + 3$



x	-2	-1	0	1	2	3
y	3.25	3.5	4	5	7	11

Describe the transformation:
up 3

Modeling Exponential Functions Problems

5) Technetium-99m is a drug taken by a patient and then used to study tumors in the brain, lungs and other parts of the body. A patient takes a 1000-mg pill. The data below shows how much active ingredient remains in the body over 6-hour time intervals.

Technetium-99m Decay

# of 6-hour time intervals	Amount of Drug remaining (mg)
0	1000
1	500
2	250
3	125

a) What is the initial value? 1000

b) What is the growth/decay factor? 1/2 or 0.50

c) Write a rule for the function.
$y = 1000(0.5)^x$

6) In television shows and movies you often see scientists studying patterns of data (growth of zombies, bacteria, etc). Below is a table that shows the number of zombies over a 4-day period.

Days	0	1	2	3	4
# of zombies	2	8	32	128	512

a) What is the initial value? 2

b) What is the growth/ decay factor? 4

$y = 2(4)^x$

Kuta Software - Infinite Algebra 2 Name Key

Exponential Equations Not Requiring Logarithms

Date________ Period____

Solve each equation.

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

$4^{2x+3} = 4^0$

$2x+3=0$

$2x=-3$

$\boxed{x=-3/2}$

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

$3-2x=-x$

$3=x$

$\boxed{x=3}$

3) $3^{1-2x} = 243$

$3^{1-2x}=3^5$

$1-2x=5$

$-2x=4$

$\boxed{x=-2}$

4) $3^{2a} = 3^{-a}$

$2a=-a$

$3a=0$

$\boxed{a=0}$

5) $4^{3x-2} = 1$

$4^{3x-2}=4^0$

$3x-2=0$

$3x=2$

$\boxed{x=2/3}$

6) $4^{2p} = 4^{-2p-1}$

$2p=-2p-1$

$4p=-1$

$\boxed{p=-\frac{1}{4}}$

7) $6^{-2a} = 6^{2-3a}$

$-2a=2-3a$

$a=2$

$\boxed{a=2}$

8) $2^{2x+2} = 2^{3x}$

$2x+2=3x$

$2=x$

$\boxed{x=2}$

9) $6^{3m} \cdot 6^{-m} = 6^{-2m}$

$6^{2m}=6^{-2m}$

$2m=-2m$

$4m=0$

$\boxed{m=0}$

10) $\frac{2^x}{2^x} = 2^{-2x}$

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

$2^0=2^{-2x}$

$0=-2x$

$\boxed{x=0}$

11) $10^{-3x} \cdot 10^x = \frac{1}{10}$

$10^{-2x}=10^{-1}$

$-2x=-1$

$\boxed{x=1/2}$

12) $3^{-2x+1} \cdot 3^{-2x-3} = 3^{-x}$

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

$-4x-2=-x$

$-2=3x$

$\boxed{x=-2/3}$

13) $4^{-2x} \cdot 4^{x} = 64$

$4^{-1x} = 4^{3}$

$-1x = 3$

$\boxed{x = -3}$

14) $6^{-2x} \cdot 6^{-x} = \frac{1}{216}$

$6^{-2x} \cdot 6^{-x} = 6^{-3}$

$6^{-3x} = 6^{-3}$

$-3x = -3$

$\boxed{x = 1}$

15) $2^{x} \cdot \frac{1}{32} = 32$

$2^{x} \cdot 2^{-5} = 2^{5}$

$x - 5 = 5$

$\boxed{x = 10}$

16) $2^{-3p} \cdot 2^{2p} = 2^{2p}$

$2^{-1p} = 2^{2p}$

$-1p = 2p$

$0 = 3p$

$\boxed{p = 0}$

17) $64 \cdot 16^{-3x} = 16^{3x-2}$

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

$4^{3} \cdot 4^{-6x} = 4^{6x-4}$

$3 - 6x = 6x - 4$

$7 = 12x$

$\boxed{x = 7/12}$

18) $\frac{81^{3n+2}}{243^{-n}} = 3^{4}$

$\frac{(3^{4})^{3n+2}}{(3^{5})^{-n}} = 3^{4}$

$\frac{3^{12n+8}}{3^{-5n}} = 3^{4}$

$3^{17n+8} = 3^{4}$

$17n + 8 = 4$

$17n = -4$

$\boxed{n = -4/17}$

19) $81 \cdot 9^{-2b-2} = 27$

$3^{4} \cdot (3^{2})^{-2b-2} = 3^{3}$

$3^{4} \cdot 3^{-4b-4} = 3^{3}$

$3^{-4b} = 3^{3}$

$-4b = 3$

$\boxed{b = \frac{-3}{4}}$

20) $9^{-3x} \cdot 9^{x} = 27$

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

$3^{-6x} \cdot 3^{2x} = 3^{3}$

$3^{-4x} = 3^{3}$

$-4x = 3$

$\boxed{x = \frac{-3}{4}}$

21) $\left(\frac{1}{6}\right)^{3x+2} \cdot 216^{3x} = \frac{1}{216}$

$(6^{-1})^{3x+2} \cdot (6^{3})^{3x} = (216)^{-1}$

$6^{-3x-2} \cdot 6^{9x} = 6^{-3}$

$6^{6x-2} = 6^{-3}$

$6x - 2 = -3$

$6x = -1$

$\boxed{x = -1/6}$

22) $243^{k+2} \cdot 9^{2k-1} = 9$

$(3^{5})^{k+2} \cdot (3^{2})^{2k-1} = 3^{2}$

$3^{5k+10} \cdot 3^{4k-2} = 3^{2}$

$3^{9k+8} = 3^{2}$

$9k + 8 = 2$

$9k = -6$

$\boxed{k = -6/9}$

23) $16^{r} \cdot 64^{3-3r} = 64$

$(4^{2})^{r} \cdot (4^{3})^{3-3r} = 4^{3}$

$4^{2r} \cdot 4^{9-9r} = 4^{3}$

$4^{9-7r} = 4^{3}$

$9 - 7r = 3$

$-7r = -6$

$\boxed{r = 6/7}$

24) $16^{2p-3} \cdot 4^{-2p} = 2^{4}$

$(2^{4})^{2p-3} \cdot (2^{2})^{-2p} = 2^{4}$

$2^{8p-12} \cdot 2^{-4p} = 2^{4}$

$2^{4p-12} = 2^{4}$

$4p - 12 = 4$

$4p = 16$

$\boxed{p = 4}$