Bell Work:

Rewrite each radical as an exponential function

1) $\sqrt[5]{x}$ $x^{\frac{1}{5}}$

2) $\sqrt{8}$ $8^{\frac{1}{2}}$

3) $\sqrt[4]{7^3}$ $7^{\frac{3}{4}}$

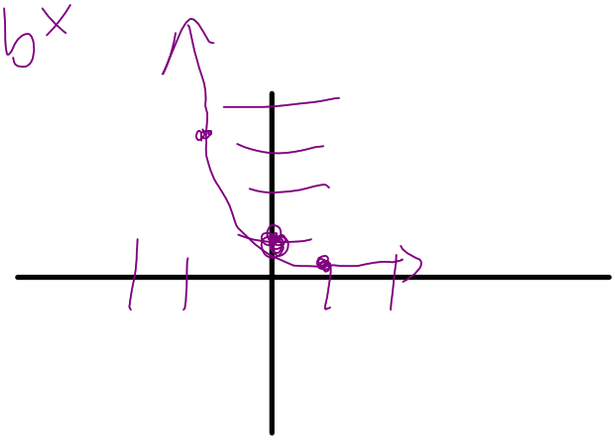
Exploring Exponential Functions

Graph each function.

$y = a\,b^x$

1) $y = (0.3)^x$

x	-2	-1	0	1	2
y	11.1	3.33	1	.3	.09



$(.3)^1 = .3$

$(.3)^2 = .09$

$.3^{-1} = \frac{1}{.3} = 3.33$

$.3^2 = \frac{1}{.3^2} = \frac{1}{.09} = 11.1$

2) $y = 2(\frac{1}{5})^x$

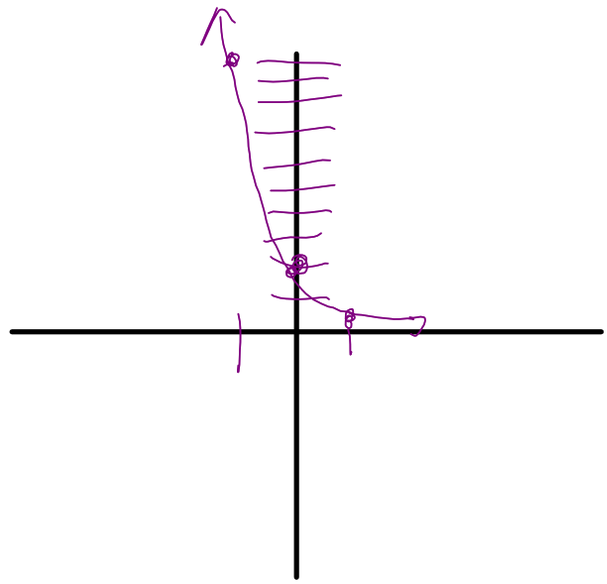
x	-2	-1	0	1	2
y	50	10	2	$\frac{2}{5}$	$\frac{2}{25}$

$2(\frac{1}{5})^1 = 2(\frac{1}{5}) = \frac{2}{5}$

$2(\frac{1}{5})^2 = 2(\frac{1}{25}) = \frac{2}{25}$

$2(\frac{1}{5})^{-1} = 2(\frac{5}{1}) = 10$

$2(\frac{1}{5})^{-2} = 2(5)^2 = 50$



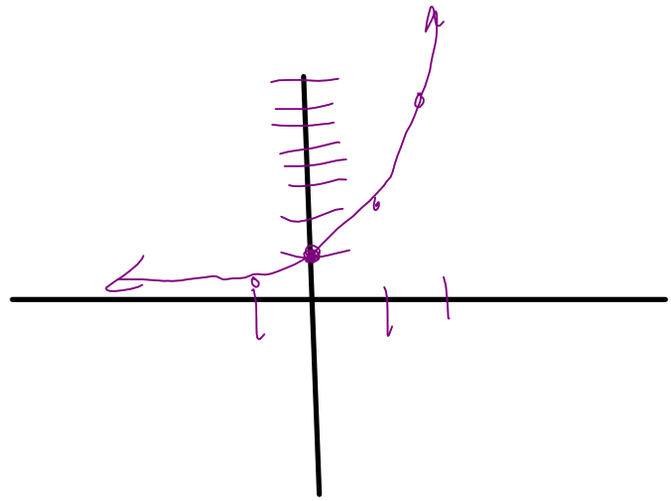
3) $s(t) = 2.5^t$

X	-2	-1	0	1	2
y	.16	.4	1	2.5	6.25

$\frac{1}{2.5} = .4$

$\left(\frac{1}{2.5}\right)^2 = \frac{1}{6.25} = .16$

$2.5^{-1} = \frac{1}{2.5^1}$



$2.5^0 = 1$

$2.5^1 = 2.5$

$2.5^2 = 6.25$

$y = a(b)^x$

Without graphing, determine whether the function represents exponential growth or exponential decay. Then find the *y*-intercept.

$b > 1$

$0 < b < 1$

4) $y = 0.99\left(\frac{1}{3}\right)^x$

decay

y-int: 0.99

5) $y = 185\left(\frac{5}{4}\right)^x$

$b = \frac{5}{4}$

growth

y-int: 185

6) $f(x) = 0.25(1.05)^x$

growth

y-int: 0.25

7) . Suppose you deposit $1500 in a savings account that pays interest at an annual rate of 6%. No money is added or withdrawn from the account.

$r = 6\% = .06 + 1 = 1.06$

annual $y = a(1+r)^t$

a) How much will be in the account after 5 years?

$y = 1500(1.06)^5$

$= 2007.34$

Quarterly $n = 4$

$y = a\left(1+\frac{r}{n}\right)^{nt}$

$1500\left(1+\frac{.06}{4}\right)^{4.5}$

$1500(1+.015)^{20}$

$1500(1.015)^{20} =$

2020.28

b) How many years will it take for the account to contain $2500?

$2500 = 1500(1.06)^t$

$1.67 = 1.06^t$

$\log_{1.06} 1.67 = t = \frac{\log 1.67}{\log 1.06} \approx 8.8$ yrs

Write an exponential function to model each situation. Find each amount after the specified time.

8) A population of 1,236,000 grows 1.3% per year for 10 years.

$1.3\% = .013 + 1 = 1.013$

$y = a(1+r)^t$

$y = 1,236,000(1.013)^{10}$

$y = 1,406,414$

9) A new car that sells for $18,000 depreciates 25% each year for 4 years.

$r = .25 \rightarrow 1 - .25 = .75$

$y = 18,000(.75)^4$

$y = 5695.32$

1+ 1−

55% = .55
1 - .55

For each annual rate of change, find the corresponding growth or decay factor.

10) +70%
1.7
growth

(11) +500%
6
growth

(12) -55%
0.45
decay

13) +0.1%
1.001
growth

(14) -0.1%
.999
decay

15) -75%
0.25
decay

70% = .7 + 1 = 1.7

16) In 2009, there were 1570 bears in a wildlife refuge. In 2010, the population had increased to approximately 1884 bears. If this trend continues and the bear population is increasing exponentially, how many bears will there be in 2015?

$t = 5$

$\frac{1884 - 1570}{1570} = .2 + 1 = 1.2$ = Growth factor

$1884(1.2)^5 =$

4687.99

= 4688 bears in 2015

17) Your friend drops a rubber ball from 4 ft. You notice that its rebound is 32.5 in. on the first bounce and 22 in. on the second bounce.

a. What exponential function would be a good model for the height of the ball?

b. How high will the ball bounce on the fourth bounce?

48 in

$\frac{48-32.5}{48} = .3229$ $\quad 1-.3229=.6771$

$\frac{15.5}{48}$

a) $48(.6771)^n$

b) $48(.6771)^4$

$= 10.09$ in

18) A new truck that sells for $29,000 depreciates 12% each year. What is the value of the truck after 7 years?

.12

1 − .12

$29{,}000(.88)^7$

$11,851.59

19) The population of an endangered bird is decreasing at a rate of 0.75% per year. There are currently about 200,000 of these birds.

a. What exponential function would be a good model for the population of these endangered birds?

b. How many birds will there be in 100 years?

$-.0075$

$1 - .0075 = .9925$

a) $200{,}000\,(.9925)^t$

b) $200{,}000\,(.9925)^{100}$

$= 94{,}207$ birds