

MAC1105 College Algebra  
5.1 Practice Problems

1. Graph the following exponential functions using transformation of functions. State the domain and range of each function

a)  $g(x) = -5^{x+2} - 4$

Base Graph

$y = 5^x$

x	y
-2	$5^{-2} = \frac{1}{25}$
-1	$5^{-1} = \frac{1}{5}$
0	$5^0 = 1$
1	$5^1 = 5$
2	$5^2 = 25$

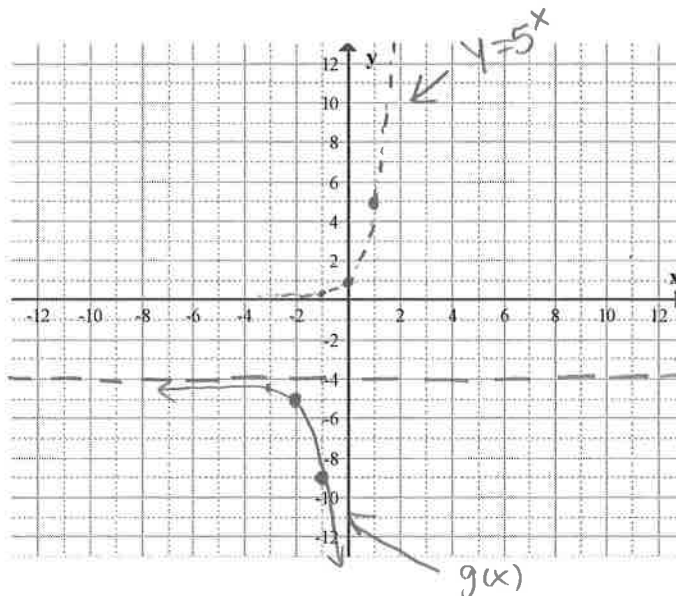
Domain:  $(-\infty, \infty)$   
Range:  $(-\infty, 4)$

Transformations

① Horizontal shift left 2 units

② Reflection over x-axis

③ vertical shift down 4 units



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

Base Graph

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

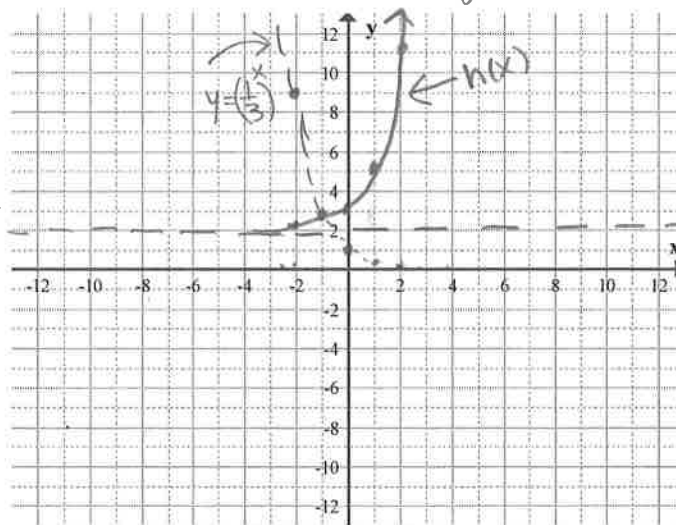
x	y
-2	$\left(\frac{1}{3}\right)^{-2} = 3^2 = 9$
-1	$\left(\frac{1}{3}\right)^{-1} = 3$
0	$\left(\frac{1}{3}\right)^0 = 1$
1	$\left(\frac{1}{3}\right)^1 = \frac{1}{3}$
2	$\left(\frac{1}{3}\right)^2 = \frac{1}{9}$

Domain:  $(-\infty, \infty)$   
Range:  $(2, \infty)$

Transformations

① Reflection over y-axis

② vertical shift up 2 units



c)  $f(x) = -e^{x-2}$

Base Graph

$y = e^x$

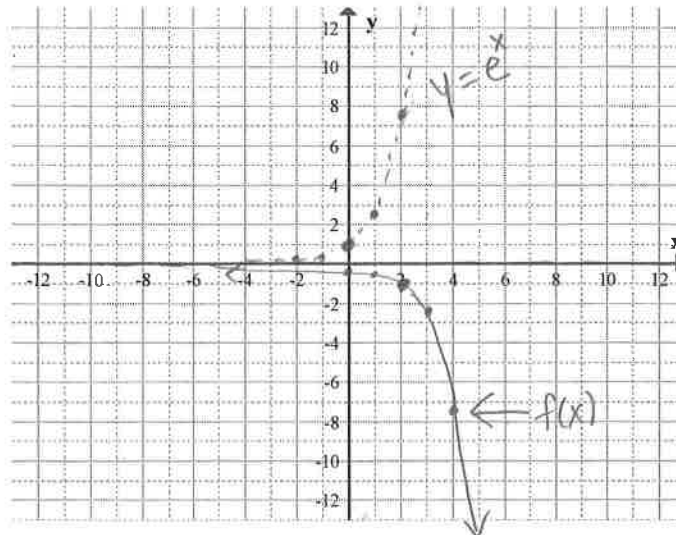
x	y
-2	$e^{-2} = \frac{1}{e^2} \approx .14$
-1	$e^{-1} = \frac{1}{e} \approx .37$
0	$e^0 = 1$
1	$e^1 = e \approx 2.72$
2	$e^2 \approx 7.39$

Transformations

① shift right 2 units

② Reflection over x-axis

Domain:  $(-\infty, \infty)$   
Range:  $(-\infty, 0)$



Solve each exponential equation by relating the bases.

2.  $4^{2x+4} = 64$

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

$$\begin{array}{r} 2x+4 = 3 \\ -4 \quad -4 \\ \hline 2x = -1 \\ \frac{2x}{2} = \frac{-1}{2} \\ x = -1/2 \end{array}$$

4.  $3^{2x+1} = \frac{1}{27}$

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

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

$$\begin{array}{r} 2x+1 = -3 \\ -1 \quad -1 \\ \hline 2x = -4 \\ \frac{2x}{2} = \frac{-4}{2} \\ x = -2 \end{array}$$

3.  $8^{x+3} = 4^{x-2}$

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

$$\begin{array}{r} 3x+9 = 2x-4 \\ -2x \quad -2x \\ \hline x+9 = -4 \\ -9 \quad -9 \\ \hline x = -13 \end{array}$$

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

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

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

$$\begin{array}{r} 2x-6 = x-2 \\ -x \quad -x \\ \hline x-6 = -2 \\ +6 \quad +6 \\ \hline x = 4 \end{array}$$

6. The average annual salary of an NBA player follow the exponential model  $S(t) = 161.4(1.169)^t$ , where  $S(t)$  is the average annual salary in thousands of dollars and  $t$  is the number of years after 1980.

- Find the average annual salary of an NBA player in 1980.
- Find the average annual salary of an NBA player in ~~1990~~ 1990.
- Find the average annual salary of an NBA player in 1998.

a. 1980  $\rightarrow t=0$

$$S(0) = 161.4(1.169)^0$$

$$= 161.4(1)$$

$$= 161.4 \text{ thousand}$$

$$\$ 161,400$$

b. 1990  $\rightarrow t=10$

$$S(10) = 161.4(1.169)^{10}$$

$$= 769.2 \text{ thousand}$$

$$\$ 769,200$$

c. 1998  $\rightarrow t=18$

$$S(18) = 161.4(1.169)^{18}$$

$$= 2682.7 \text{ thousand}$$

$$2,682,700$$

7. Susie invests 5000 dollars in a bank account paying 5% interest per year, compounded quarterly for 10 years. How much will Susie have after 10 years.

$$P = 5000$$

$$r = .05$$

$$t = 10$$

$n = 4$   
Compounded quarterly

$$A = 5000 \left(1 + \frac{.05}{4}\right)^{4 \cdot 10}$$

$$= 8218.10$$

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

8. Tito invests 5000 dollars in a bank account paying 4% interest per year, compounded continuously for 5 years. How much will Tito have after 5 years?

$$P = 5000$$

$$r = .04$$

$$t = 5$$

$$A = 5000e^{(.04 \cdot 5)}$$

$$= 6107.01$$

$$\rightarrow A = Pe^{rt}$$

9. Nicholas wants to invest 2000 dollars for 5 years. He has had two offers. One paying 4.5% per year compounded monthly and the other paying 4.45% compounded continuously. Which is the better investment?

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

$$A = 2000\left(1 + \frac{.045}{12}\right)^{12 \cdot 5}$$

$$= 2503.59$$

$$A = Pe^{rt}$$

$$A = 2000e^{.0445 \cdot 5}$$

$$= 2498.39$$

4.5% compounded monthly is a better investment.

10. The Florida Fish and Wildlife Conservation Commission estimates that the black bear population is growing exponentially by 10% and follows the model  $P = P_0 e^{.10t}$  where  $t$  is the number of years after 1995. If there were an estimated 2850 black bears in 2005, how many black bears were present in 1995?

$$2005 \rightarrow t = 10$$

$$P = P_0 e^{.10t}$$

$$\frac{2850}{e^{.10 \cdot 10}} = \frac{P_0 e^{.10 \cdot 10}}{e^{.10 \cdot 10}}$$

$$\frac{2850}{e^1} = P_0$$

$$\frac{2850}{e} = P_0$$

$$1048 = P_0$$

The black bear population in 1995 was 1048