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

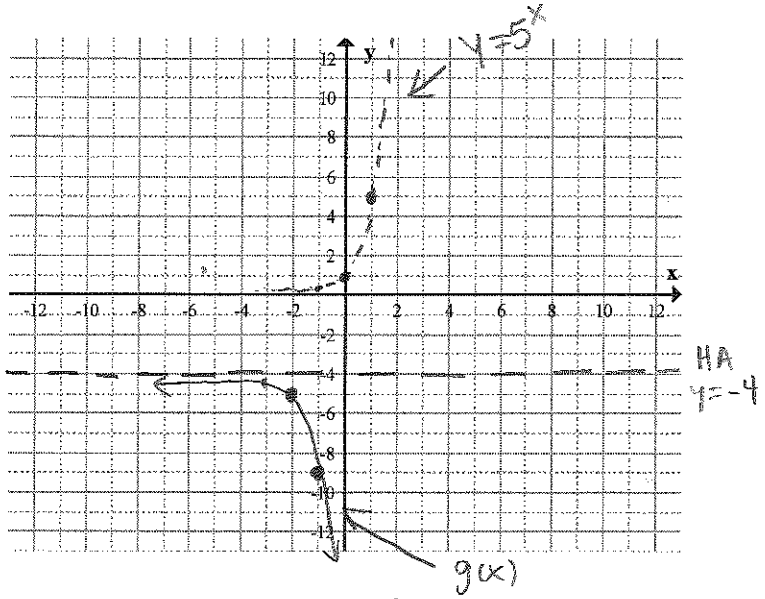
a) $g(x)=-5^{x+2}-4$

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	$5^2=25$

Transformations
① Horizontal shift left 2 units
② Reflection over x-axis
③ vertical shift down 4 units

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



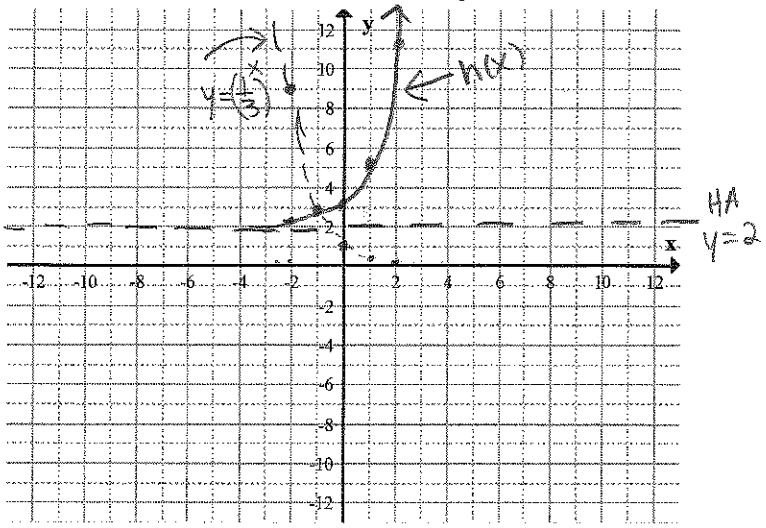
b) $h(x)=\left(\frac{1}{3}\right)^{-x}+2$

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	$\left(\frac{1}{3}\right)=\frac{1}{3}$
2	$\left(\frac{1}{3}\right)^2=\frac{1}{9}$

Transformations
① Reflection over y-axis
② vertical shift up 2 units

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



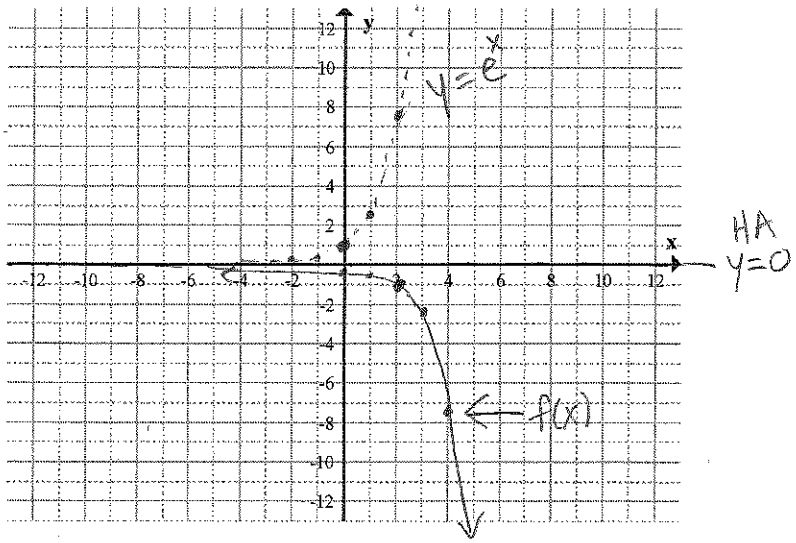
c) $f(x)=-e^{x-2}$

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

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

$2x+4=3$

$-4 \quad -4$

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

$x=-1/2$

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

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

$3x+9=2x-4$

$-2x \quad -2x$

$x+9=-4$

$-9 \quad -9$

$x=-13$

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

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

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

$2x+1=-3$

$-1 \quad -1$

$\frac{2x}{2}=\frac{-4}{2}$

$x=-2$

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

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

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

$2x-6=x-2$

$-x \quad -x$

$x-6=-2$

$+6 \quad +6$

$x=4$

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.

a. Find the average annual salary of an NBA player in 1980.

b. Find the average annual salary of an NBA player in ~~1090~~ 1990.

c. Find the average annual salary of an NBA player in 1998.

a. 1980 → $t=0$

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

$=161.4(1)$

$=161.4$ thousand

$161,400

b. 1990 → $t=10$

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

$=769.2$ thousand

$769,200

c. 1998 → $t=18$

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

$=2682.7$ 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.

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

$P=5000$

$r=.05$

$t=10$

$n=4$

compounded quarterly

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

$=8218.10$

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?

→ $A = Pe^{rt}$

$P = 5000$

$r = .04$

$t = 5$

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

$= 6107.01$

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?

($P = 2000$, $t = 5$, $r = .045$)

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

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

$= 2503.59$

$r = .0445$ $A = Pe^{rt}$

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

$= 2498.39$

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 the number of years after 1995. If there were an estimated 2850 black bears in 2005, how many black bears were present in 1995?

2015 → $t = 10$

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

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

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

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

$1048 = P_0$

The black bear population in 1995 was 1048