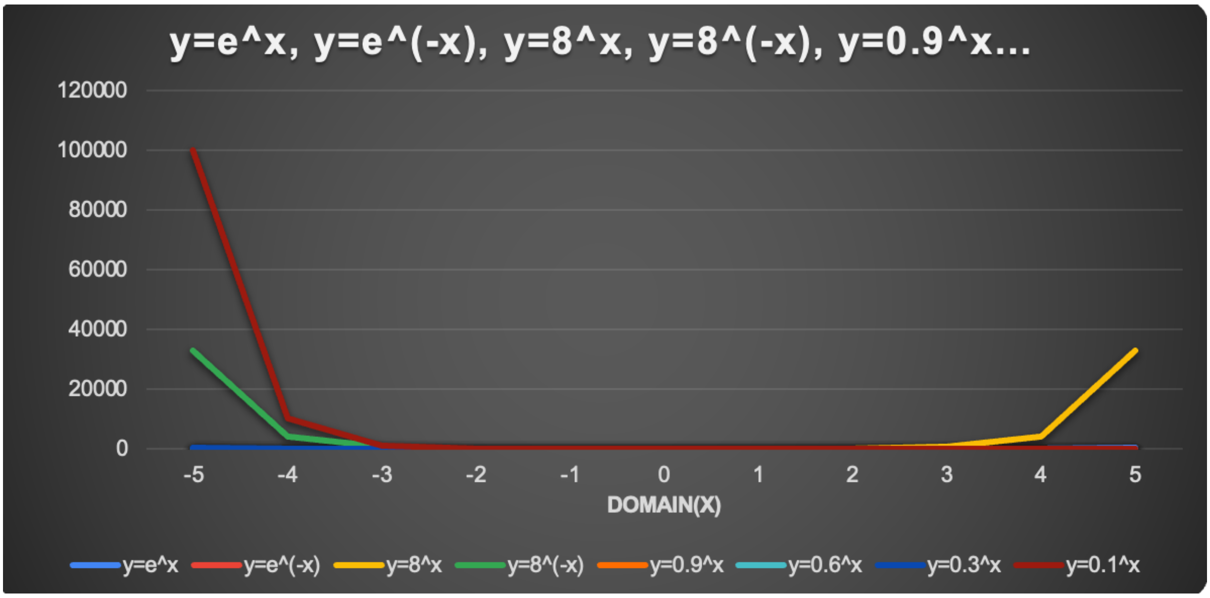
Question-1:

		Question-1						
Domain(x)	**y=e^x**	**y=e^(-x)**	**y=8^x**	**y=8^(-x)**	**y=0.9^x**	**y=0.6^x**	**y=0.3^x**	**y=0.1^x**
-5	0.0067	148.4132	0	32768	1.6935	12.8601	411.5226	100000
-4	0.0183	54.5982	0.0002	4096	1.5242	7.716	123.4568	10000
-3	0.0498	20.0855	0.002	512	1.3717	4.6296	37.037	1000
-2	0.1353	7.3891	0.0156	64	1.2346	2.7778	11.1111	100
-1	0.3679	2.7183	0.125	8	1.1111	1.6667	3.3333	10
0	1	1	1	1	1	1	1	1
1	2.7183	0.3679	8	0.125	0.9	0.6	0.3	0.1
2	7.3891	0.1353	64	0.0156	0.81	0.36	0.09	0.01
3	20.0855	0.0498	512	0.002	0.729	0.216	0.027	0.001
4	54.5982	0.0183	4096	0.0002	0.6561	0.1296	0.0081	0.0001
5	148.4132	0.0067	32768	0	0.5905	0.0778	0.0024	0



Question-2:

We've given that f(x)=10^x

To prove,

$\frac{f(x+h)-f(x)}{h} = 10^x \left(\frac{10^h - 1}{h}\right)$

Here, taking LHS

$$\frac{f(x+h)-f(x)}{h}$$

= $\frac{10^{x+h}-10^x}{h}$ (Since, f(x)=10^x)

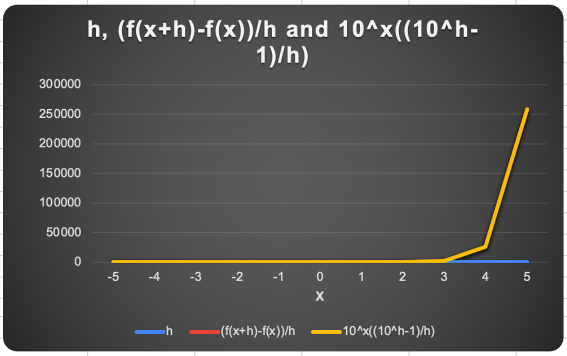
= $\frac{10^x . 10^h - 10^x}{h}$

= $\frac{10^x\,(10^h - 1)}{h}$

Hence, LHS = RHS

Question-2:

x	h	(f(x+h)-f(x))/h	10^x((10^h-1)/h)
-5	0.1	2.58925E-05	2.58925E-05
-4	0.1	0.000258925	0.000258925
-3	0.1	0.002589254	0.002589254
-2	0.1	0.025892541	0.025892541
-1	0.1	0.258925412	0.258925412
0	0.1	2.589254118	2.589254118
1	0.1	25.89254118	25.89254118
2	0.1	258.9254118	258.9254118
3	0.1	2589.254118	2589.254118
4	0.1	25892.54118	25892.54118
5	0.1	258925.4118	258925.4118



Question-3:
To compare the functions f(x) = x^5 and g(x) = 5^x and determine which grows more rapidly when x is large, we can plot their curves in Excel and observe their behavior.

Let's create a table in Excel with the x-values ranging from, for example, 0 to 10. In the adjacent column, we can calculate the corresponding y-values for each function using the formulas f(x) = x^5 and g(x) = 5^x.

After inputting the formulas and generating the values, we can select the data and create a scatter plot in Excel. The x-values will be plotted on the horizontal axis, and the corresponding y-values will be plotted on the vertical axis.

Upon examining the graph, we can observe that both curves start at the point (0, 0) since f(0) = 0^5 = 0 and g(0) = 5^0 = 1. As x increases, the function f(x) = x^5 grows rapidly but still follows a polynomial growth pattern. On the other hand, the function g(x) = 5^x grows even more rapidly and exhibits an exponential growth pattern.

We can compare their derivatives to prove mathematically that g(x) = 5^x grows more rapidly than f(x) = x^5 as x becomes large.

The derivative of f(x) = x^5 can be calculated as follows: f'(x) = 5x^4 The derivative of g(x) = 5^x can be determined using the chain rule and logarithmic differentiation:

g'(x) = 5^x * ln(5)

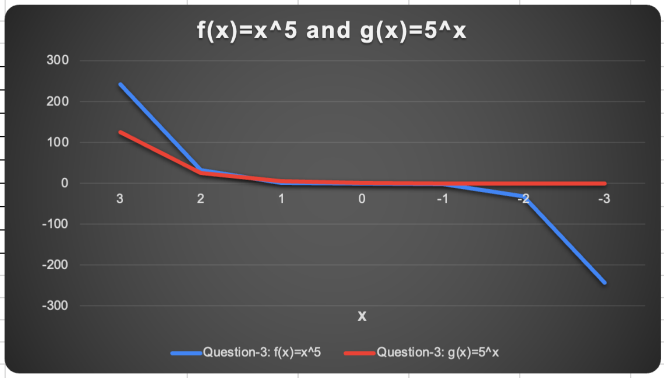
When evaluating these derivatives, it becomes evident that the rate of change of f(x) is dependent on the value of x and is limited by the power of x^4. As x approaches infinity, the derivative will tend to infinity but remain constrained by the power term.

However, the derivative of g(x) = 5^x includes the function value 5^x itself, multiplied by the natural logarithm of 5. This implies that the rate of change of g(x) is directly proportional to its function value, resulting in exponential growth. As x becomes large, no limiting factor restricts the growth of g(x).

Therefore, based on the mathematical analysis, we can conclude that g(x) = 5^x grows more rapidly than f(x) = x^5 when x is large.

Question-3:

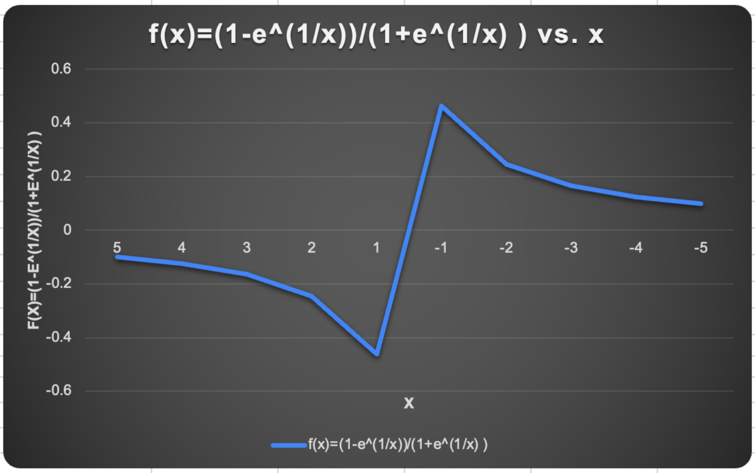
x	f(x)=x^5	g(x)=5^x
3	243	125
2	32	25
1	1	5
0	0	1
-1	-1	0.2
-2	-32	0.04
-3	-243	0.008



Question-4:

Question-4

x	f(x)=(1-e^(1/x))/(1+e^(1/x)
5	-0.099667995
4	-0.124353002
3	-0.165140413
2	-0.244918662
1	-0.462117157
-1	0.462117157
-2	0.244918662
-3	0.165140413
-4	0.124353002
-5	0.099667995



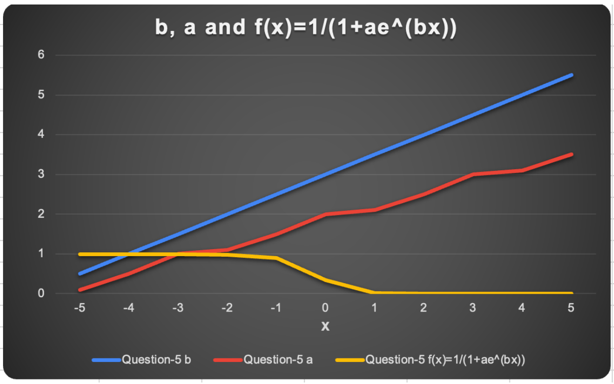
Question-5:

Answer for a: The graph f(x) becomes steeper as b increases when the value of a > 0.

Answer for b: As, a increases, the amplitude of graph f(x) increases.

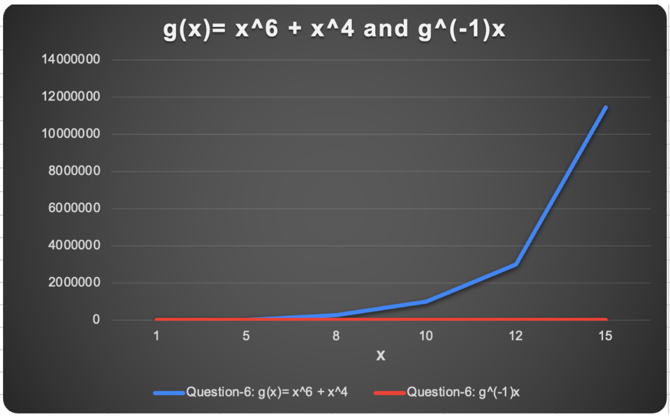
Question-5

x	b	a	f(x)=1/(1+ae^(bx))
-5	0.5	0.1	0.991858331
-4	1	0.5	0.990925285
-3	1.5	1	0.989013057
-2	2	1.1	0.980250691
-1	2.5	1.5	0.890370863
0	3	2	0.333333333
1	3.5	2.1	0.014175862
2	4	2.5	0.000134167
3	4.5	3	4.56986E-07
4	5	3.1	6.64888E-10
5	5.5	3.5	3.25712E-13



Question-6:

	Question-6:	
x	g(x)= x^6 + x^4	g^(-1)x
1	2	0.5
5	16250	6.15385E-05
8	266240	3.75601E-06
10	1010000	9.90099E-07
12	3006720	3.32588E-07
15	11441250	8.7403E-08



Question-7:
#Solution-a
We've Given that,

Q(t) = $Q_o(1- e^{-\frac{t}{a}}\ )$

$\frac{Q}{Q_o}$ = 1- $e^{-\frac{t}{a}}$

Rearranging the equation we get,

1-$\frac{Q}{Q_o}$ = $e^{\frac{t}{a}}$

Taking log on both sides, we get

In (1-$\frac{Q}{Q_o}$) = -$\frac{t}{a}$

t= -a * In (1-$\frac{Q}{Q_o}$) (eqn -1)

Therefore, Q' (t) = -a * In (1-$\frac{Q}{Q_o}$)

#Solution-b:
Given:
a = 2

Q(t) = 0.9Q0 (90% capacity represented by 0.9 times Q0)

Substituting these values into the equation:
t = -2 * ln(1 - 0.9)
t = -2 * ln(0.1)
t = -2 * (-2.3)
t = 4.6 seconds.