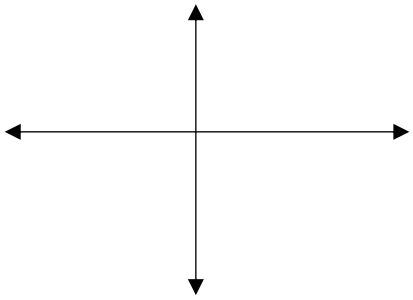
Name_____ Group_____ /50

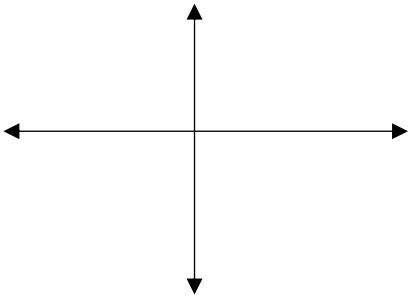
## Exponential Functions

1) Sketch the following functions (4 pts)

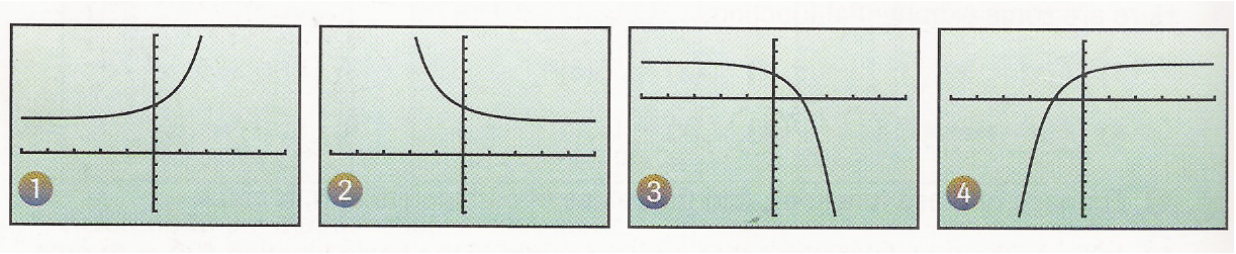
a) $f(x) = 4(0.5)^{x+8} - 4$



b) $f(x) = -2(2)^{x}$



2) Below are the graphs of 4 exponential functions whose rules are in the form $f(x) = ac^{b(x-h)} + k$. (4 pts)




For each case, determine the signs of parameters a and b when $0 < c < 1$ *and* $c > 1$

| | Graph 1 | Graph 2 | Graph 3 | Graph 4 |
|---|---|---|---|---|
| **when 0 < c < 1** | **a =**<br>**b =** | **a =**<br>**b =** | **a =**<br>**b =** | **a =**<br>**b =** |
| **when c > 1** | **a =**<br>**b =** | **a =**<br>**b =** | **a =**<br>**b =** | **a =**<br>**b =** |

3) Points (0.5, 3.2) and (-1, 0.05) belong to an exponential function in the form of $y = ac^x$. Find the rule. (2 pts)

4) For each of the three functions below, state the range; whether the function is increasing or decreasing; whether it has a zero (not the value); the y-intercept & the equation of the asymptote. (4 pts)

| | **Range** | **Increasing Decreasing?** | **Zero? (Y or N)** | **Y-intercept** | **Asymptote** |
|---|---|---|---|---|---|
| $f(x) = 3(2)^x + 14$ | | | | | |
| $g(x) = -(3)^{2x+8}$ | | | | | |
| $h(x) = -\left(\frac{1}{2}\right)^{2x} + 1$ | | | | | |

5) Solve the following exponential functions (16 pts)

a) $5^{-2(x+3)} = 625$

b) $-\left(\frac{1}{3}\right)^x = -(3)^7$

c) $(\sqrt{4})^{x+1} - 64 = 0$

d) $2^{x-2} = 32^{x+2}$

e) $4^{x^2-9} = 1$

f) $2 \times 2^{x^2-5} = 8^x$

g) $0.25(5)^x > 31.25$

h) $2\left(\frac{1}{3}\right)^{x+2} - 18 < 0$

6) A fur dealer tells a customer that since her store opened 15 years ago, the average price of a lynx skin has risen. Over the past 15 years, the price of a lynx skin has increased according to the rule $p = 30(1.25)^t$, where *t* is the time in years. What was the price of a lynx skin 10 years after the store opened? (4 pts)

7) Given $f(x) = 3(0.5)^{x-2} + 10$ and $g(x) = -3x - 5$ solve for $f \circ g(x) = 13$. (4 pts)

8) The temperature of a cup of tea decreases exponentially as time passes. The relation between the time *x* in minutes & temperature *T* is defined by:

$$T = (Tea's\ original\ Temp - Room\ Temp) \times 0.9^x + Room\ Temp$$

At precisely 6:00pm, one cup of tea is placed on a table & another is placed in a refrigerator. Both cups of tea are 100°C. The table is in a room whose temperature in 20°C. The refrigerator is at a temperature of 5°C.

At 10 minutes, what is the difference in temperature between the two cups of tea?

(4 pts)

9) In 1960 Adrienne bought a new convertible for $8000. Over the next 6 years, her car depreciated each year by 15% of the previous year's value. During the next 4 years, the value of the car remained the same. Then because it was so rare & beautiful, her car was classified as a collector's item. From this point on, the value of her shiny old convertible increased by 10% each year.

What was the value of the car 30 years after it was purchased? (4 pts)

10) Given $f(x) = ac^{x-h} + k$ where $c>1$ and $a<0$, $b<0$, $k>0$ and $h>0$ (4 pts)

State whether the function is increasing or decreasing. _____

State the range. _____

State the domain. _____