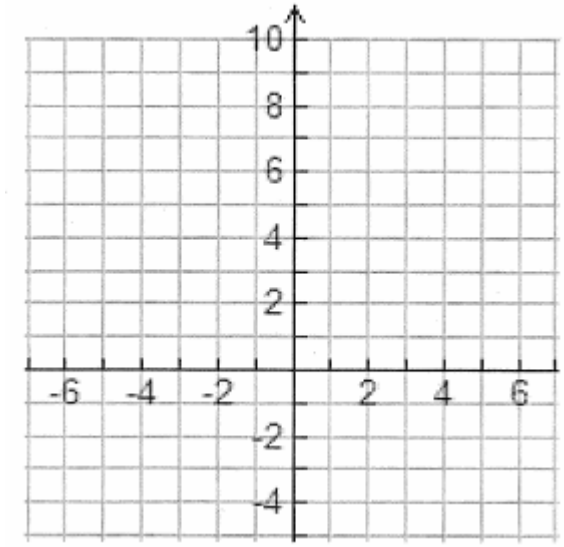
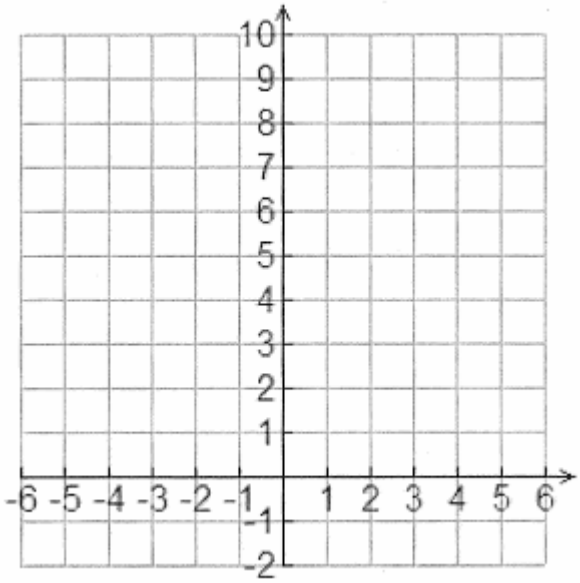
Transforming Exponential Functions

1. Using mapping notation , sketch the graph of $f(x) = 2^x$, $g(x) = 2^x + 4$ and $h(x) = 2^x - 3$.



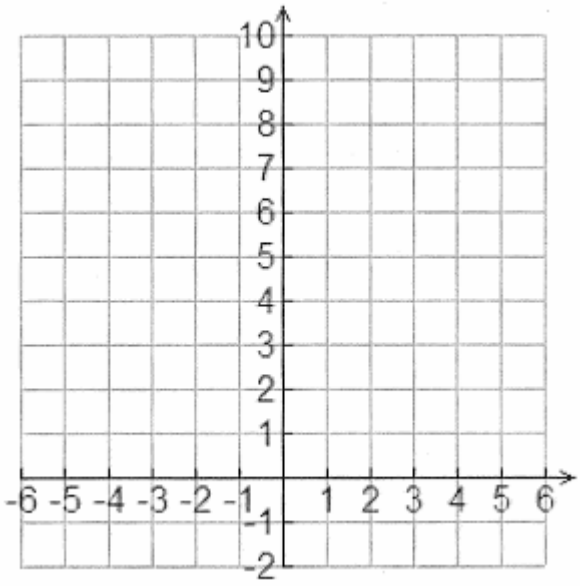
	Domain	Range	y-intercept	Asymptote
$f(x) = 2^x$				
$g(x) = 2^x + 4$				
$h(x) = 2^x - 3$				
$\boldsymbol{f(x) = b^x + c}$				

2. Using MAPPING NOTATION, sketch the graph of $f(x) = 2^x$, $g(x) = 2^{x-2}$ and $h(x) = 2^{x+3}$.



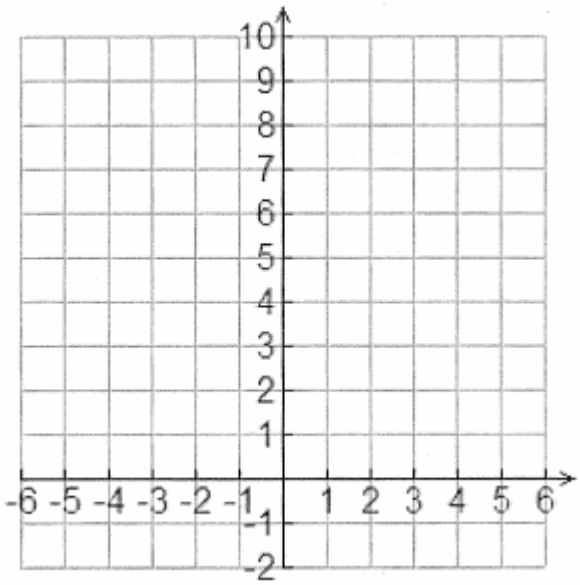
	Domain	Range	y-intercept	Asymptote
$f(x) = 2^x$				
$g(x) = 2^{x-2}$				
$h(x) = 2^{x+3}$.				
$\boldsymbol{f(x) = b^{x+d}}$				

3. Using MAPPING NOTATION, sketch the graph of $f(x) = 2^x$, $g(x) = 3(2^x)$, and $h(x) = \frac{1}{2}(2^x)$.



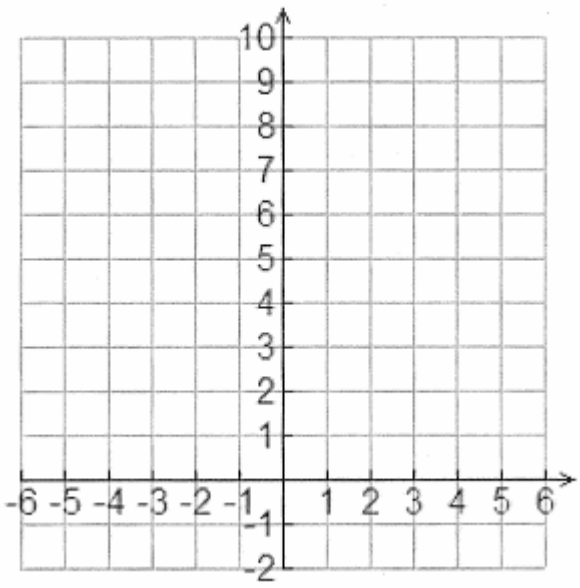
	Domain	Range	y-intercept	Asymptote
$f(x) = 2^x$				
$g(x) = 3(2^x)$				
$h(x) = \frac{1}{2}(2^x)$				
$\boldsymbol{f(x) = a(b^x)}$				

4. Using MAPPING NOTATION, sketch the graph of $f(x) = 2^x$, $g(x) = 2^{2x}$, and $h(x) = 2^{\frac{1}{2}x}$.

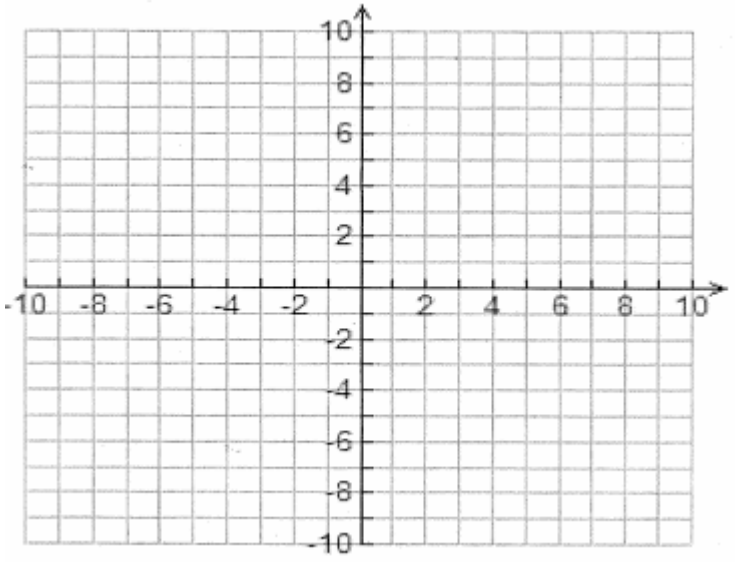


	Domain	Range	y-intercept	Asymptote
$f(x) = 2^x$				
$g(x) = 2^{2x}$				
$h(x) = 2^{\frac{x}{2}}$				
$\boldsymbol{f(x) = b^{kx}}$				

Use the graph of $f(x) = 3^x$ to sketch the graph of $g(x) = 3^{2x}$.



5. **a.** Use the graph of $f(x) = 2^x$ to sketch the graph of $g(x) = 2^{-x}$ and $h(x) = -2^x$



	Domain	Range	y-intercept	Asymptote
$f(x) = 2^x$				
$g(x) = 2^{-x}$				
$h(x) = -2^x$				
$\boldsymbol{f(x) = b^{-x}}$				
$\boldsymbol{f(x) = -b^x}$				

6. State the MAPPING NOTATION, and then **describe** the transformations:

a. $f(x) = 3(2^{-x+2}) - 1$

b. $f(x) = -4^{-2x+2} + 7$

General form of transformed exponential function:

$$y = a\left[b^{k(x-d)}\right] + c$$

Effect of :

y coordinate

- ***a: when* i) $a > 1$, *it is a vertical stretch by a factor of* $|a|$** *ex:* y = 2[3^x]
  - **ii) $0 < a < 1$, *it is a vertical compression by a factor of* $|a|$** *ex:* y = 0.5[3^x]
  - **iii) $a < 0$, *it is a vertical reflection ex:*** y = -2[3^x]
- ***c: when* $c > 0$, *vertical shift "c" units up ex:*** y = 2[3^x] + 1
  - ***c* < 0, *vertical shift "c" units down ex:*** y = 2[3^x] - 1

x coordinate

- ***k: when* $k > 1$, *it is a horizontal compression by a factor of* $|\frac{1}{k}|$ *ex:*** y = 3^{2x}
  - **$0 < k < 1$, *it is a horizontal stretch by a factor of* $|\frac{1}{k}|$ *ex:*** y = $3^{1/2x}$
- ***d: when* $d > 0$, *horizontal shift "d" units right ex:*** y = $3^{2(x-2)}$
  - ***d* < 0, *horizontal shift "d" units left ex:*** y = $3^{2(x+2)}$

REMEMBER TO FACTOR

- ***b: when* $b > 0$, *it is an exponential GROWTH ex:*** y = 2[3^x]
- ***b* < 0, *it is an exponential DECAY ex:*** y = $(1/3)^x$