3.5 Transformations of Exponential Functions - Worksheet

MCR3U Jensen

1) Describe the transformations that map the function $y = 2^x$ onto each of the following functions...

a)
$$y = 2^x - 2$$

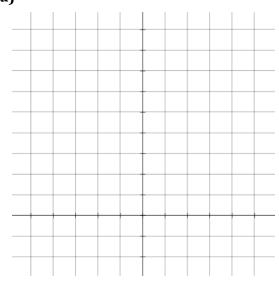
b)
$$y = 2^{x+3}$$

c)
$$y = 4^{3}$$

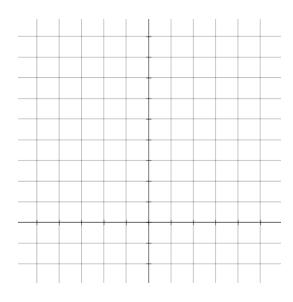
c)
$$y = 4^x$$
 d) $y = 3(2^{x-1}) + 1$

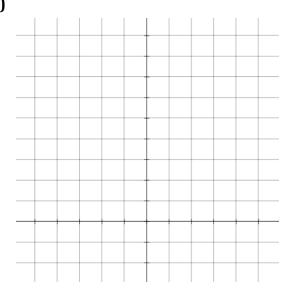
2) Create a sketch of each graph for each equation in question 1. (a table of values may help)

a)

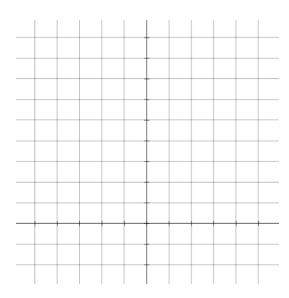


b)





d)



- **3)** Write the equation for the function that results from each transformation applied to the base function $y = 5^x$.
- a) translate down 3 units

b) shift right 2 units

c) translate left $\frac{1}{2}$ unit

 ${f d}{f)}$ shift up 1 unit and left 2.5 units

4) Describe the transformations that map the function $y = 8^x$ onto each function.

$$\mathbf{a)} \ y = \left(\frac{1}{2}\right) 8^x$$

b)
$$y = 8^{4x}$$

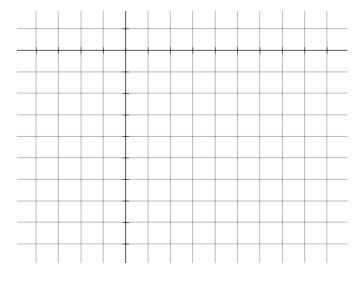
c)
$$y = -8^x$$

d)
$$y = 8^{-2x}$$

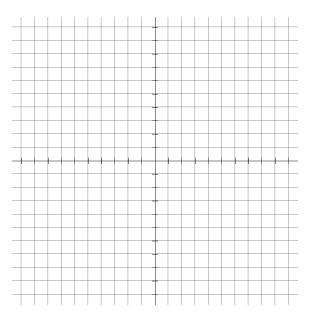
- **5)** Write the equation for the function that results from each transformation applied to the base function $y = 7^x$
- a) reflect in the x-axis (vertical reflection)
- **b)** stretch vertically by a factor of 3

- c) stretch horizontally by a factor of 2.4
- **d)** reflect in the y-axis and stretch vertically by bafo 7

6) Sketch the graph of $y = \left(-\frac{1}{2}\right)2^{x-4}$ by using $y = 2^x$ as the base and applying transformations.



7) Sketch the graph of $y = 3^{-0.5x-1} - 5$ by using $y = 3^x$ as the base and applying transformations.



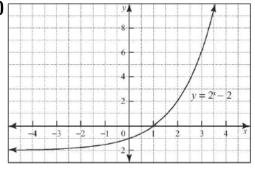
8) a) Rewrite $y = 9^x$ using a base of 3. Describe how you can graph this function by transforming the graph of $y = 3^x$.

b) Rewrite $y = 9^x$ using a base of 81. Describe how you can graph this function by transforming the graph of $y = 81^x$.

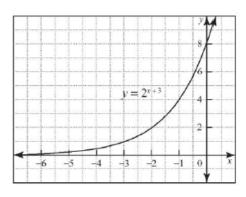
Answers

1) a) translate 2 units down **b)** translate 3 units left **c)** horizontal compression by a factor of $\frac{1}{2}$ **d)** vertical stretch by a factor of 3, a translation 1 unit to the right and 1 unit up

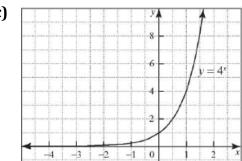
2) a)



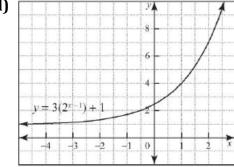
b)



c)

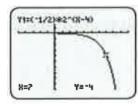


d)

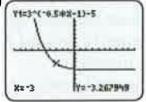


- **3) a)** $y = 5^x 3$ **b)** $y = 5^{x-2}$ **c)** $5^{x+\frac{1}{2}}$ **d)** $y = 5^{x+2.5} + 1$
- **4) a)** vertical compression by a factor of $\frac{1}{2}$ **b)** horizontal compression by a factor of $\frac{1}{4}$
 - c) vertical reflection (reflection in the x-axis)
 - **d)** horizontal reflection (reflection in the y-axis) and horizontal compression by a factor of $\frac{1}{2}$
- **5) a)** $y = -7^x$ **b)** $y = 3(7^x)$ **c)** $y = 7^{\frac{x}{2.4}}$ **d)** $y = 7(7^{-x})$

6)



7)



- **8) a)** $y = 3^{2x}$; horizontal compression of the graph of $y = 3^x$ by a factor of $\frac{1}{2}$
 - **b)** $y = 81^{\frac{1}{2}x}$; horizontal stretch of the graph of $y = 81^x$ by a factor of 2