Exponential Functions & their Graphs

Definition 1. *An exponential function with base a is a function of the form*

$$f(x) = a^x,$$

where a *and* x *are real numbers and*

- *x is the independent VARIABLE of the function; and*
- *a is a number FIXED CONSTANT such that* $a > 0$ *and* $a \neq 1$.

Use a calculator to evaluate $f(x) = 7^x$ **at the indicated values.**

1. $f(-0.5)$, 1. _____

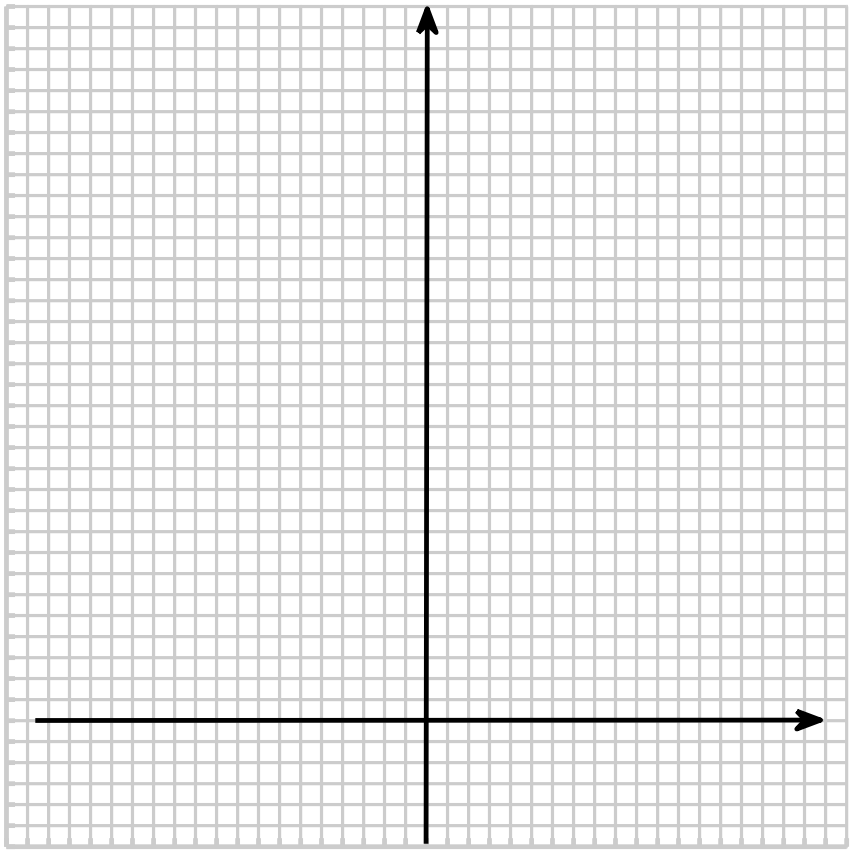
2. $f(\sqrt{3})$, 2. _____

3. $f(\frac{1}{6})$ 3. _____

4. $f(x) = 3^{x-1}$; find $f(-4.5)$, 4. _____

Sketch the graph of $f(x) = 2^x$ **and** $f(x) = 2^x$**. Use the length of two squares as a single unit.**

x	$f(x) = 2^x$
-4	
-3	
-2	
-1	
0	
1	
2	
3	
4	

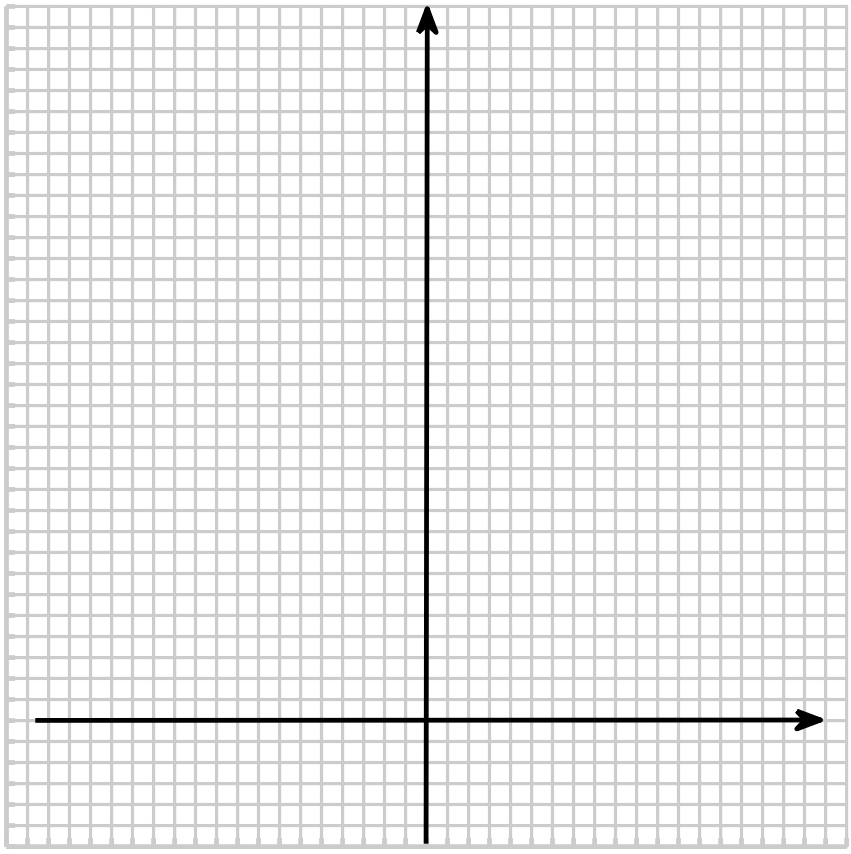


Let $g(x) = \left(\frac{1}{2}\right)^x$. We know from transformations theory that the graph of $g(x) = f(-x) = 2^{-x}$ is obtained from reflecting the graph of f around the y-axis.

Sketch the graph of $g(x)$ on the same set of axes given above.

Use the graph of $f(x) = 2^x$ to sketch the graph of the given function.

$g(x) = 2^{x-4} + 1$



5. What interval represents the domain of g? 5. _____

6. What equation represents the horizontal asymptote for g? 6. _____

7. What interval represents the range of g? 7. _____

8. What two statements describe the end behavior of the graph of the function? 8. _____

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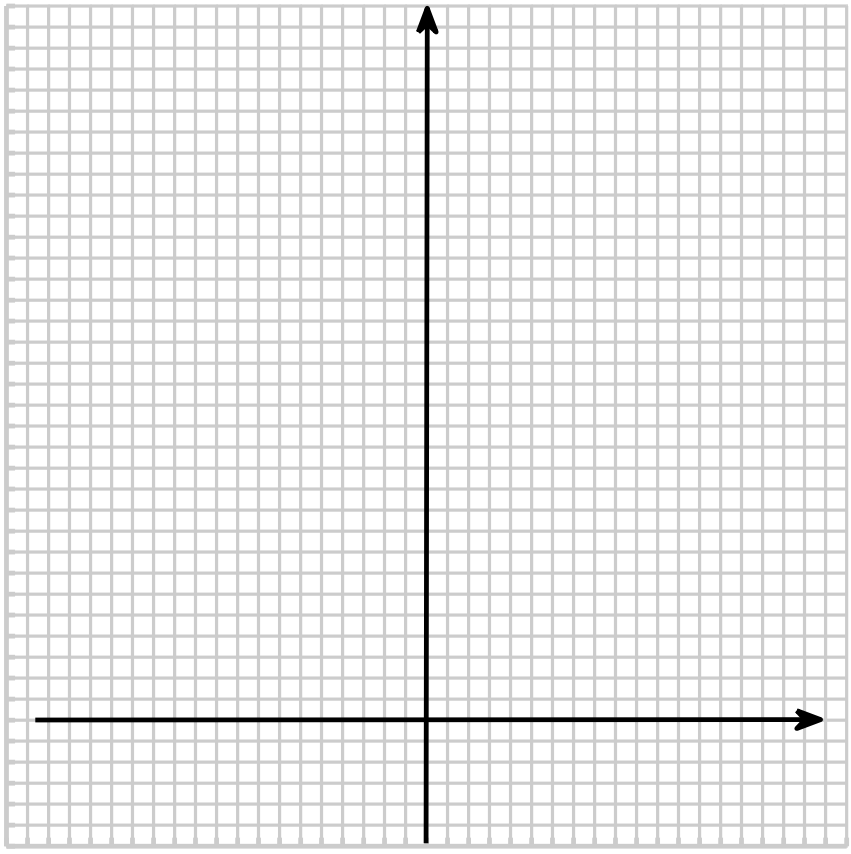

9. What interval represents the domain of h? 9. _____

10. What equation represents the horizontal asymptote for h? 10. _____

11. What interval represents the range of h? 11. _____

Use graph paper to graph each function. Label intercepts, asymptotes and at least three ordered pairs.

1. $f(x) = 3^x$

2. $f(x) = 2^x + 3$

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

Graph.

4. $x = 5^y$

5. $x = 2^{-y}$

6. The percentage of smokers P who, without telephone counseling, have successfully quit smoking for t months can be approximated by

$$P(t) = 9.02(0.93)^t$$

This comes from a study published in the Bismarkey Journal. Estimate the percentage of smokers not receiving telephone counseling who are successful in quitting for 1 month, 3 months, and 1 year.

Compound Interest Annually Formula

If a principal P (dollars) is invested for t years at an annual rate r, and it is compounded n times per year, then the amount A, or ending balance, is given by

$$A = P(1 + r)^t$$

7. Suppose you invest \$25,000 at an interest rate of 3.5% compounded annually.

a Find a function for the amount in the account after t years.

b Find the amount of money in the account at $t = 0$, $t = 3$, $t = 8$, and $t = 10$ years.

c Graph the function.