

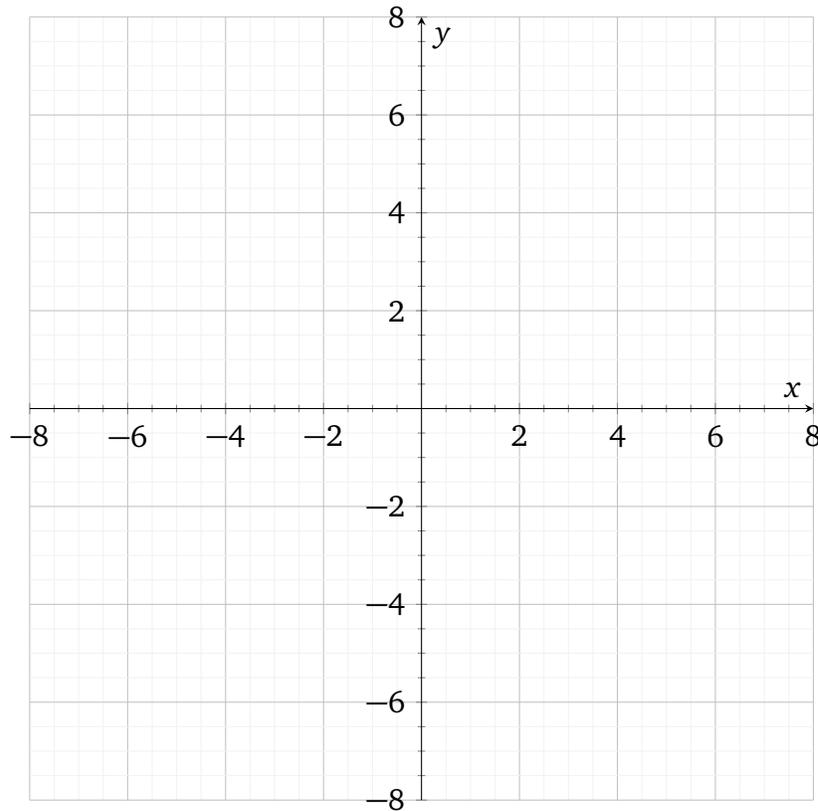
Name: _____

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| <ol style="list-style-type: none">1. Please justify all answers and show your work.2. You may work with classmates, but all answers must be your own. |
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1. Make sure that when submitting your homework on Gradescope you indicate which page of your homework each question is on.
2. Find the slant asymptote of $f(x) = \frac{2x^3+x^2+x}{x^2+x+1}$. Show your work.

3. Find the holes, vertical asymptotes, horizontal asymptotes, x-intercepts, and y-intercepts of $f(x) = \frac{(x-5)(x+2)(x-4)^2}{-2(x-5)(x-2)(x+1)^2}$ (write them below the graph). Use this to sketch the graph. The sketch doesn't have to be exact, but make sure to use all the information you find above, and make sure your graph has the correct behavior at all the asymptotes and x-intercepts.



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4. Find an equation for an exponential function which passes through the points $(-3, 4)$ and $(2, 3)$. Is this an exponential growth or exponential decay function? Show your work.

5. Suppose you bought a car for \$28000 in 2010. In 2016, the value of the car was \$11000. Assuming the value of the car continues to decay at the same rate, find an equation for $f(t)$ where

$$f(t) = \text{the car's value } t \text{ years after 2010.}$$

What is the value of the car in 2020? Show your work.

6. Suppose colony of bacteria starts with 1000 cells and the number of cells doubles every minute. Write a formula for a function which computes the number of bacteria cells in the colony after t minutes. Show your work.

7. Describe the behavior of the function $f(x) = -2(3)^{-x} - 1$ as $x \rightarrow \infty$ and as $x \rightarrow -\infty$. Show your work.

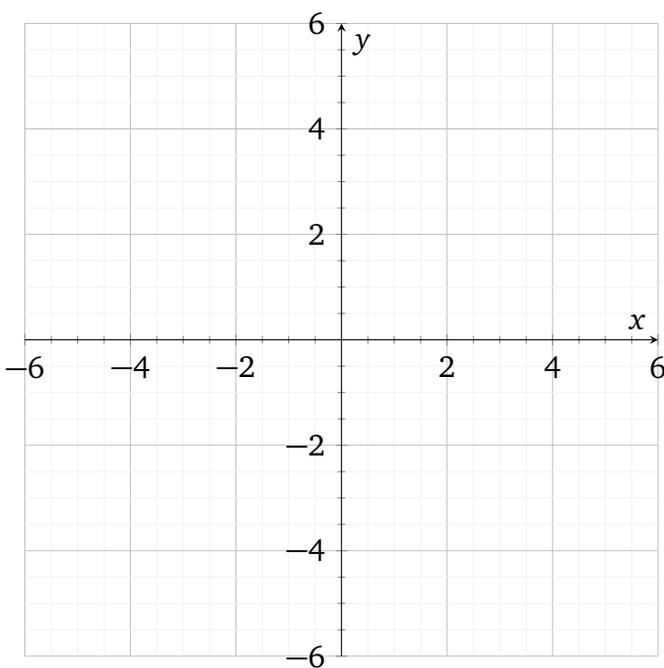
8. Sketch graphs of the following functions on the same coordinate axes. Don't plot any points except for the y -intercepts; simply make sure they have the correct shape relative to each other (i.e. which functions are growing, which functions are decaying, which functions are growing faster than others, which functions are decaying faster than others?). Clearly label each function.

1. $f(x) = 2(2)^x$

2. $g(x) = 2(1.2)^x$

3. $h(x) = 2(0.8)^x$

4. $k(x) = 2(0.2)^x$



9. Let $f(x) = 3 \cdot 4^x$. Find equations for the following transformations of $f(x)$

(a) $g(x)$, which is $f(x)$ shifted 3 units left

(b) $h(x)$, which is $f(x)$ reflected over the y -axis.

(c) $k(x)$, which is $f(x)$ vertically stretched by a factor of 8.