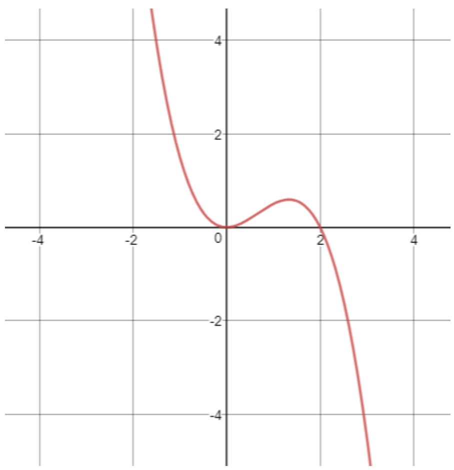
Inverse Functions

1. Suppose the rate in cubic feet per second at which water flows into a tank with volume q cubic feet is given by $r = f(q)$. Interpret $f^{-1}(r)$ in the context of this problem.

2. Determine if the following could represent an **invertible** function. Explain your answer.

   (a) 

   (b)

x	-10	-8	-3	-1	2	7	9
$f(x)$	-1	4	5	-3	1	4	8

3. Use the table below to evaluate the given quantities:

x	-10	-8	-3	-1
$f(x)$	-1	4	5	-3
$g(x)$	4	2	-3	-5

   (a) $f(-10)$

   (b) $f^{-1}(5)$

   (c) $f(g^{-1}(-3))$

4. The following functions are invertible. Please write a formula for each function's inverse.

   (a) $y = f(x) = \sqrt[3]{\dfrac{x+2}{3}}$

   (b) $s = g(r) = 10e^{-0.25r}$

   (c) $M = c(p) = \dfrac{p-3}{p}$

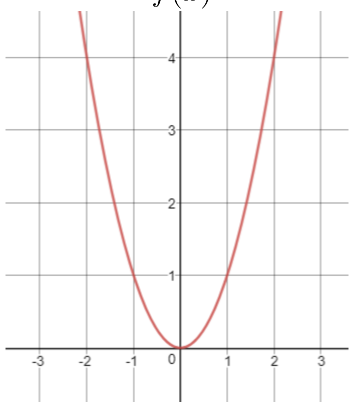
5. Write 2 questions dealing with inverse functions that you think may be similar to those on Exam 2.

Composite Functions

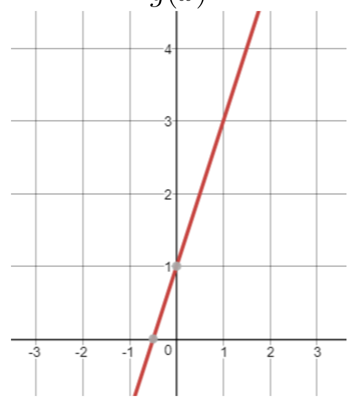
1. Suppose that $P(A)$ is the price of a room at a hotel as a function of the number of rooms available A, and $A(m)$ is the number of rooms available as a function of the month of the year m. Provide a practical interpretation of $P(A(m))$ in the context of this problem.

2. Consider the functions $f(x)$ and $g(x)$ given below:

$f(x)$



$g(x)$



Using the graphs from above, evaluate the following:

(a) $f(-1)$

(b) $g(0)$

(c) $g(f(1))$

(d) $f(g(0))$

3. Let $f(x) = x^2 - 1$ and $g(x) = x + 2$. Find and simplify the following compositions of functions.

(a) $f(g(x))$

(b) $g(f(x))$

4. Find possible formulas for $u(x)$ and $v(x)$ given $u(v(x))$ below.

(a) $u(v(x)) = \sqrt[3]{x^4 - 6}$

(b) $u(v(x)) = e^{x+2}$

(c) $u(v(x)) = \dfrac{1}{x^2 + 1}$

5. Write 2 questions dealing with composite functions that you think may be similar to those on Exam 2.

Exponential Functions

1. Decide whether the functions represented in the tables below could be linear, exponential, or neither. *Be sure to explain your answers.*
   If the function could be linear or exponential, please write an equation for the function.

   (a)

x	1	2	4	5
$f(x)$	20	13	5.4925	3.5701

   (b)

x	0	1	3	5
$f(x)$	0	5	7	13

2. In 2000, the worldwide giraffe population was believed to be 140 thousand. The giraffe population plummeted over the next 15 years. In 2015, there was a recorded giraffe population of 84 thousand. Assuming the giraffe population has been decreasing exponentially at a constant rate each year, write a formula $P(t)$ which gives the giraffe population in thousands t years after 2000.

3. Suppose a bank pays interest at the nominal rate of 10% per year. Find the effective annual rate if interest is compounded:

   (a) Annually

   (b) Weekly

   (c) Daily

   (d) Continuously

4. Let $A(t)$ be the amount of a material (in kg) that is radioactive after t days. Suppose $A(0) = 100$ kg.

   (a) Suppose the amount of radioactive material decays at a rate of 45% each day. Find a function for $A(t)$.

   (b) Suppose the amount of radioactive material decays continuously at a rate of 45% each day. Find a function for $A(t)$.

5. Write 2 questions dealing with exponential functions that you think may be similar to those on Exam 2.

Logarithmic Functions

1. Rewrite the following using exponents instead of logarithms:
   (a) $\log_4(16) = 2$
   (b) $\log(0.001) = -3$
   (c) $\ln(7) \approx 1.94591$

2. Rewrite the following using logarithms instead of exponents:
   (a) $36^2 = 1296$
   (b) $10^{-0.5} \approx 0.31622777$
   (c) $e^2 \approx 7.3890561$

3. Use properties of logarithms to solve for x in each of the following. *Be sure to give exact answers.*
   (a) $e^x = 9$
   (b) $10(6)^{2t} = 40$
   (c) $\log(x) - \log(x^3) = -2$
   (d) $\ln(10e^{0.25x}) = 10$

4. Suppose you invest \$1500 in a bank which pay interest at a continuous rate of 5%. How many years will it take for you to have an account balance of \$4000?

5. Let $f(t) = 22.5(1.025)^t$.
   (a) Write $f(t)$ as $y = ae^{rt}$.
   (b) Find the effective annual growth rate.
   (c) Find the continuous growth rate.

6. Let $g(t) = 10e^{-0.23t}$
   (a) Write $g(t)$ as $y = a(b)^t$.
   (b) Find the effective annual growth rate.
   (c) Find the continuous growth rate.

7. Find the doubling time of a population that grows at a rate of 12.45% per year.

8. Write 2 questions dealing with logarithms that you think may be similar to those on Exam 2.