

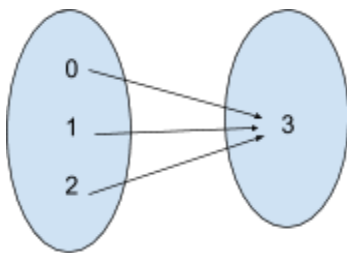
## Characteristics and Properties of Functions Unit Test

### Knowledge

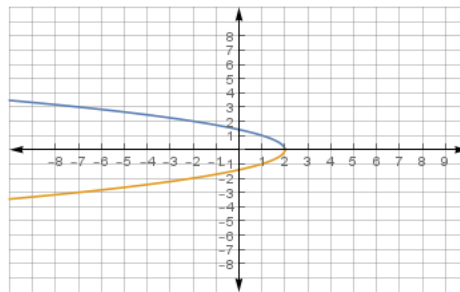
1) Solve  $|2 - 7x| > 3$  and show the solutions on a number line.

2) State the domain/range for each relation below and whether it is a function.

a)



b)



c)  $y = 4\sin(x) - 3$

3) State whether each function is odd, even or neither.

a)  $y = -4x^3 + 3x$

b)  $y = 2x^4 - x^2 + 4$

c)  $y = \sin x$

4) What is the range of  $y = -3(x + 4)^2 - 1$ ?

5) If  $f(x) = \frac{2(x-1)}{3}$ , find  $\frac{f(4)-f^{-1}(4)}{f(1)-f^{-1}(1)}$

## *Application*

1) If  $f(x) = \sqrt{x}$ , graph  $-4f(2x + 6) - 1$  and state the domain and range

2) Graph the function below. State if it's continuous or any discontinuities.

$$f(x) = \begin{cases} -7 & x \leq 0 \\ x^2 + 4 & 0 < x < 3 \\ -x + 16 & x \geq 3 \end{cases}$$

3) If  $f(x) = -x^2 - 2x + 4$  and  $g(x) = 2^x + 1$ , graph each below on the domain  $-3 \leq x \leq 3$ .

a)  $f + g$

b)  $f - g$

4) Graph the function below and state its domain and range.

$$f(x) = \frac{-4}{x+5} - 3$$

5) Write the equation for when  $f(x) = |x|$  undergoes the following transformations : vertical stretch by 4, horizontal stretch by  $\frac{3}{2}$ , reflected in the x and y axis, translated 4 units to the left and 1 unit down.

## Thinking

1) Write a piecewise function modelling this tiered tax system. Income up to \$60,000 is taxed at 20%, income between \$60,000 and \$140,000 at 40%, income over \$140,000 at 55%.

2) What values of  $m$  and  $n$  will make this function continuous?

$$f(x) = \begin{cases} -4x + m & x \leq -2 \\ 2^x + n & -2 < x \leq 3 \\ 10 & x > 3 \end{cases}$$

3)  $(3, 6)$  is on the graph  $y = -3f(\frac{1}{2}x + 3) - 4$ . What is the original point on  $f(x)$ ?

4) What is the domain and range for the inverse of  $y = -1(x + 2)^2 - 3$ ?

5) Draw a graph with the following properties :

- vertical asymptote at  $x = 3$
- $f(0) = -4$  and  $f(-3) = 0$
- As  $x \rightarrow -\infty$ ,  $y \rightarrow 2$
- interval of decrease  $(-\infty, 3)$
- interval of increase  $(3, \infty)$

## *Communication*

- 1) *State transformations performed on  $f(x) = |x|$  to get  $y = \frac{1}{4}|\frac{2}{3}x + 4| - 3$*
- 2) *State 3 different ways to find the inverse of function. Show the ways to find the inverse of  $f(x) = 3x^2 - 1$ .*
- 3) *State a characteristic that  $f(x) = \sin(x)$  and  $g(x) = \frac{1}{x}$  have in common and a characteristic that is different.*
- 4) *The function  $f(x) = x$  is its own inverse. Show that there are an infinite amount of linear functions with this property.*
- 5) *State the parent functions that have these characteristics*
  - a) *the function is neither odd or even and as  $x \rightarrow \infty$ ,  $y \rightarrow \infty$*
  - b) *intervals of decrease are  $(-\infty, 0)$  and  $(0, \infty)$*
  - c) *domain is  $[0, \infty)$*