

Composition of functions:

$$f(x) = \sqrt{2x + 4}$$

$$g(x) = \frac{1}{x}$$

$$h(x) = -3$$

Find Domain, Range (= image) of  $f$ ,  $g$ ,  $h$ .

Discuss Domain, Range, and how this affects composition of functions.

E.g. If  $f : A \rightarrow B$  and  $g : C \rightarrow D$ , then  $g \circ f : A' \rightarrow B \cap C \rightarrow D$  (where  $D$  is the codomain, not necessarily the range of  $g \circ f$ , and  $A' \subset A$ ,  $f(A') \subset B \cap C$ ).

You should use the above notation, but explain they don't have to understand it (not all students will have seen  $\cap$ , etc). You can then illustrate what the above means using the examples  $g \circ f$ ,  $f \circ g$ ,  $h \circ f$ ,  $f \circ h$ . Emphasize that they only need to know that the domain of  $g \circ f$  is a subset of (which may or may not be equal to) the domain of  $f$

Calculate  $g \circ f$ ,  $f \circ g$ ,  $h \circ f$ ,  $f \circ h$  and the domain of  $g \circ f$ ,  $f \circ g$ ,  $h \circ f$ ,  $f \circ h$  by looking at the pre-image of  $B \cap C$ .

Don't bother to calculate the range of  $g \circ f$ ,  $f \circ g$ ,  $h \circ f$ ,  $f \circ h$ . Instead use the final range as the codomain of the composition of functions. You should state that we use codomain instead of range when we are too lazy to calculate the range (we will later discuss onto, and this should help them understand onto and the difference between range and codomain).

Also do some messy algebraic examples (ignoring domain/range)

For example  $k(x) = \frac{1}{x+x^2}$ , calculate  $k \circ k$ .