CALCULUS 12 **FUNCTIONS**

FORMAL DEFINITION OF INCREASING AND DECREASING FUNCTIONS

Let f be a function defined on interval I and let x_1 and x_2 be any two points in I.

1. If $f(x_2) > f(x_1)$ whenever $x_1 < x_2$, then f is said to be **increasing on I.**

2. If $f(x_2) < f(x_1)$ whenever $x_1 < x_2$, then f is said to be **decreasing on I.**

A function that is increasing or decreasing on I is called MONOTONIC on I.

Task: Sketch four different graphs of increasing functions

Task: Sketch four different graphs of decreasing functions

Task: Sketch a graph of a function that is neither increasing nor decreasing over the entire domain of the function.

INVERSE OF A FUNCTION

- For an inverse of a function to be also a function, the original function must pass the **horizontal line test**
- A Function that passes the horizontal line test is called **one-to-one function**

Task: Sketch 3 graphs of functions that pass the horizontal line test

Task: Sketch 3 graphs of functions that pass the horizontal line test when their domain is restricted. **State the interval of the domain where the given function is 1-to-1**

COMPOSITE FUNCTIONS

$f(g(x))$ = "f of g of x" = composing g and f = "g before f" = "first g then f" = $f \circ g$

Example: a) Find formula of $f(g(x))$ if $f(x) = x^3 + 5x$ and $g(x) = 0.5x - 2$. Then evaluate $f(g(x))$ at $x=1$

b) Find formula of $g(f(x))$ and evaluate it at $x=5$

HW: p 21 #63-66