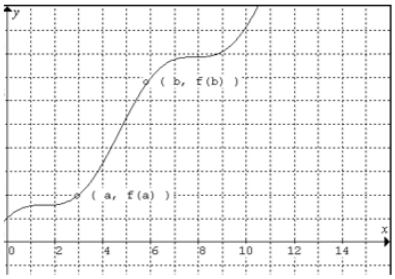
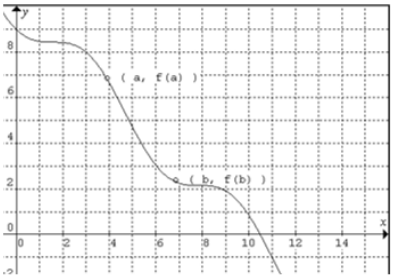
Lesson 1 - Increasing vs. Decreasing Functions

PART A: Relating slope to intervals of increase and decrease

$f(x)$ is said to be increasing over an interval $[a,b]$ where $b > a$ if $f(b) > f(a)$.

$f(x)$ is said to be decreasing over an interval $[a,b]$ where $b > a$ if $f(b) < f(a)$.





$f(x)$ is increasing in the interval $[a,b]$

If $f(x)$ is increasing, the slopes of the tangents are positive.

$f(x)$ is decreasing in the interval $[a,b]$

If $f(x)$ is decreasing, the slopes of the tangents are negative.

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Example 1: For each of the following functions, determine the intervals during which the function is increasing or decreasing.

a) $f(x) = x^2 - 6x + 2$

$f'(x) = 2x - 6$

$0 = 2x - 6$

$\frac{6}{2} = 2x$

$3 = x$

	$x<3$	3	$x>3$
$f'(x)$	—	0	+
$f(x)$	↘	↔	↗

dec inc

$\therefore$ increasing $(3, \infty)$ and decreasing $(-\infty, 3)$.

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b). $y = x^3 - 6x^2 - 15x + 1$

$y'(x) = 3x^2 - 12x - 15$

$0 = 3(x^2 - 4x - 5)$

$0 = 3(x-5)(x+1)$

$x = -1, 5$

$\therefore$ increasing $(-\infty, -1) \cup (5, \infty)$ and decreasing $(-1, 5)$

	$x<-1$	-1	$-1<x<5$	5	$x>5$
$f'(x)$	+	0	−	0	+
$f(x)$	↗	↔	↘	↔	↗

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