Concavity: 2nd derivative

p. 278 - 286 (4.2)

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A differentiable function f is:

1. Concave up if $f'(x)$ is increasing or if $f''(x) > 0$.
2. Concave down if $f'(x)$ is decreasing or if $f''(x) < 0$.

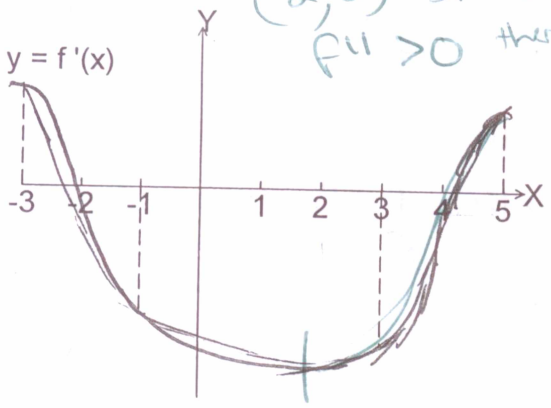
Concavity Test

For a function whose 2nd derivative exists:

1. If $y'' > 0$, then y is concave up (above the tangent lines)
2. If $y'' < 0$, then y is concave down (below the tangent lines)

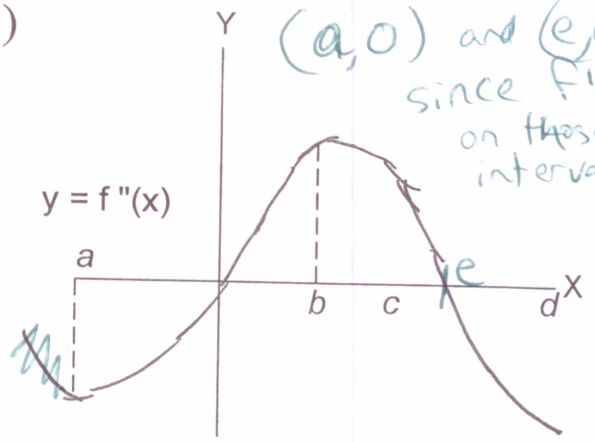
For the following graphs, determine the intervals where f is
a) concave up and justify b) concave down and justify

1)



(2,5) since f'' > 0 there.

2)



(a,0) and (e,d) since f'' < 0 on those intervals.

3. Some values for a function f, which is continuous on a domain of [-3, 0) and (0, 3] are listed below. Determine the intervals for which f is a) concave up and b) concave down. c) Determine the x-value, if any, where the concavity changes. Justify.

x	-3	-2	-1	0	1	2	3
f	-3.333	-2.5	-2	und.	2	2.5	3.333
f'	0.889	0.75	0	und.	0	0.75	0.889

a) cc up (0,3] since f'' > 0 on (0,3)
cc down (-3,0) since f'' < 0 on (-3,0)
b) x = 0 since f'' changes from (−) to (+) there