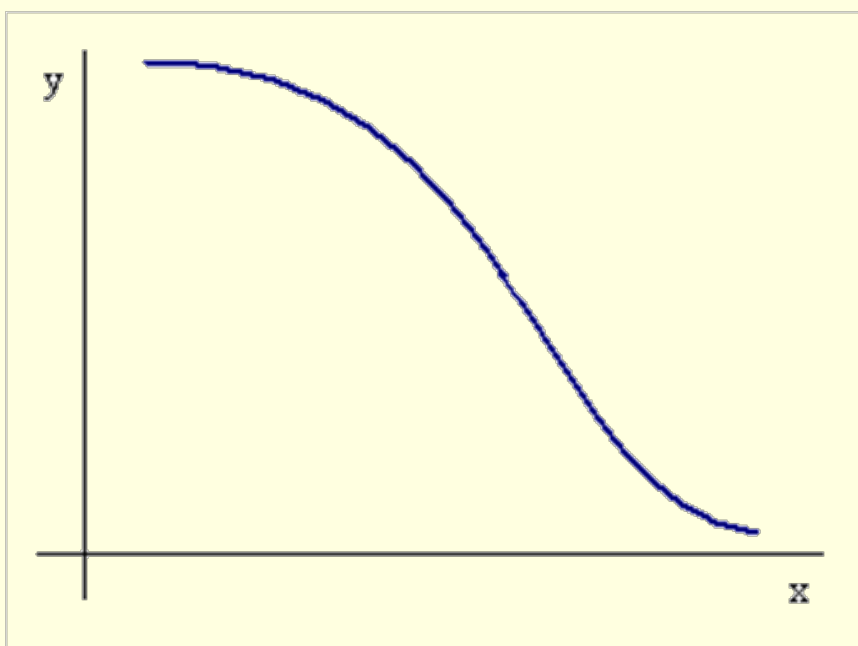


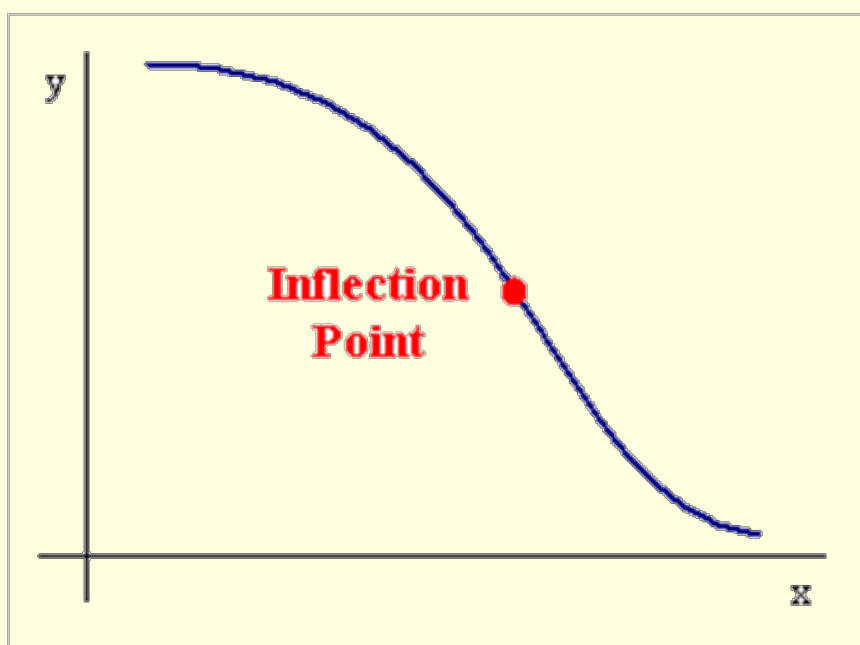
CALCULUS Unit #2 : Applications of Derivatives

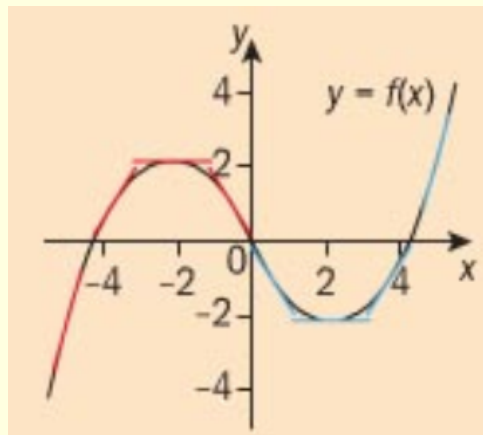
7.6 Concavity and the Second Derivative Test

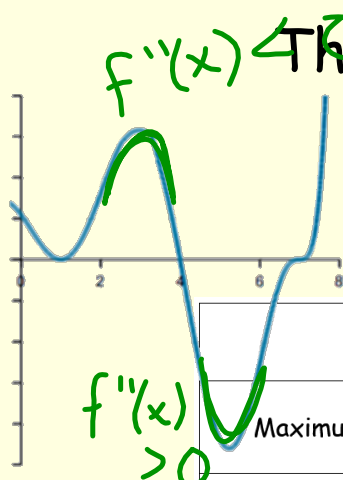
Consider a hill for skiing.
Where is the fastest part on the hill?
What is true there about the slope?



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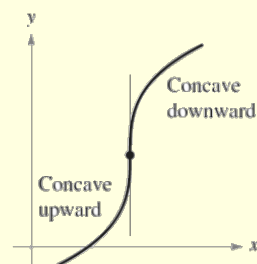
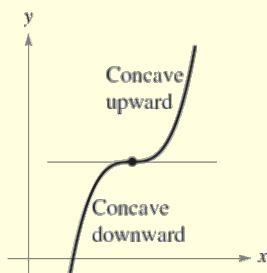
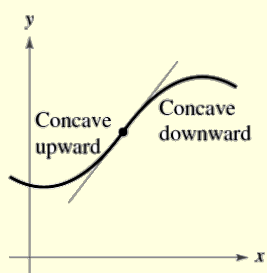






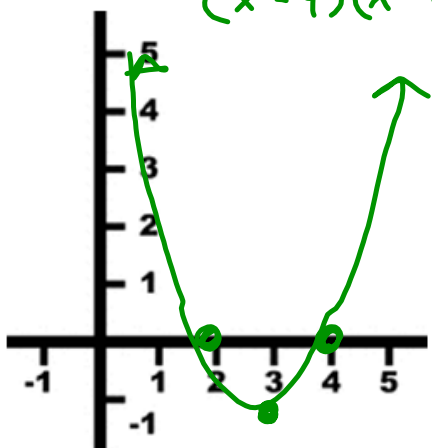
The Second Derivative Test for Concavity

	x -values	$f'(x)$	$f''(x)$	Sketch
Maximum		+ 0 -	-	
Minimum		- 0 +	+	
Point of Inflection		+ 0 +	0	
Point of Inflection		- 0 -	0	



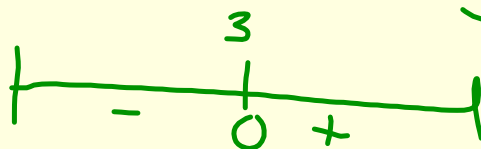
The First and Second Derivative Tests

3. $f(x) = x^2 - 6x + 8$
 $(x-4)(x-2)$



$$f'(x) = 2x - 6 = 0$$

$$f''(x) = 2 \quad (+) \text{ always } (+)$$

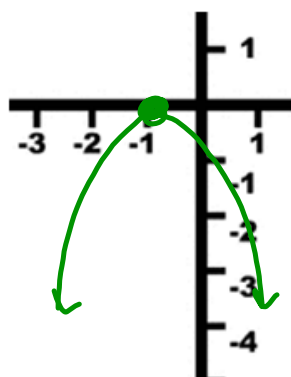


U
min.

$$(3, -1)$$

The First and Second Derivative Tests

4. $y = -(x + 1)^2$



$$y' = -2(x + 1) = -2x - 2$$

$$y'' = -2 \ominus$$

always $\ll \downarrow$

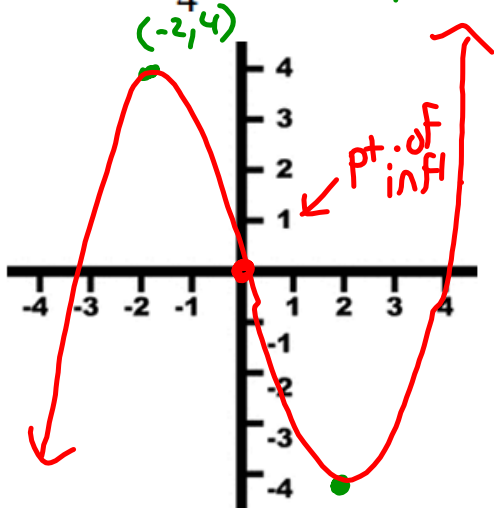
$$-2x - 2 = 0$$

$$x = -1 \text{ max.}$$

$$(-1, 0) \text{ max}$$

6 = $x^2 - 3$ The First and Second Derivative Tests

5. $y = \frac{x^3}{4} - 3x = \frac{1}{4}x^3 - 3x$



$$y' = \frac{3}{4}x^2 - 3$$

$$y'' = \frac{6}{4}x = \frac{3}{2}x$$

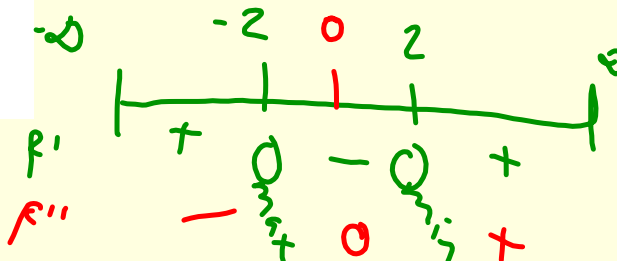
$$\frac{3}{4}x^2 - 3 = 0$$

$$x^2 = 4$$

$$x = \pm 2$$

$$\frac{3}{2}x = 0$$

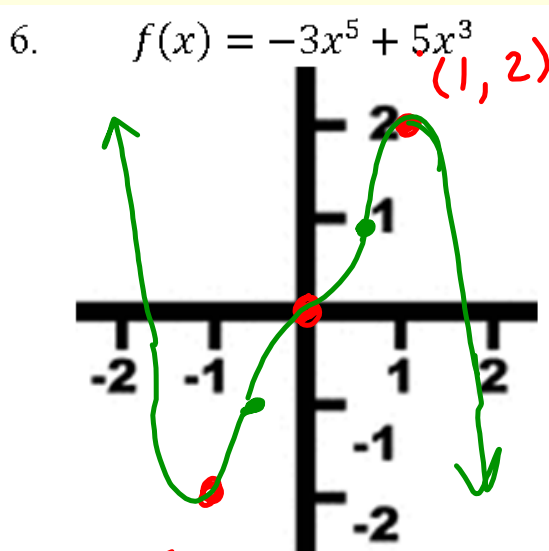
$$x = 0$$



$$(2, -4)$$

y'
 y''

The First and Second Derivative Tests



$(-1, -2)$

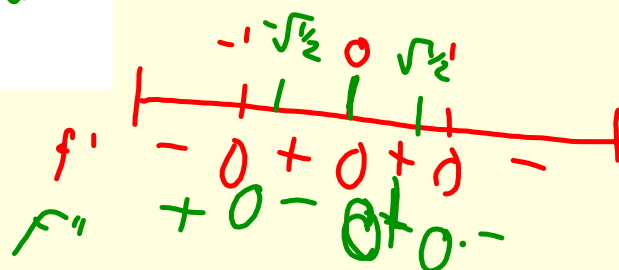
$(1, 2)$ $f'(x) = -15x^4 + 15x^2$

$f''(x) = -60x^3 + 30x$

$$-15x^4 + 15x^2 = 0 \quad | \quad -60x^3 + 30x = 0$$

$$-15x^2(x^2 + 1) = 0 \quad | \quad -30x(2x^2 - 1) = 0$$

$$x = 0, -1, 1 \quad | \quad x = 0, \pm\sqrt{\frac{1}{2}}$$



Homework:

Page 236 (1-8 all)