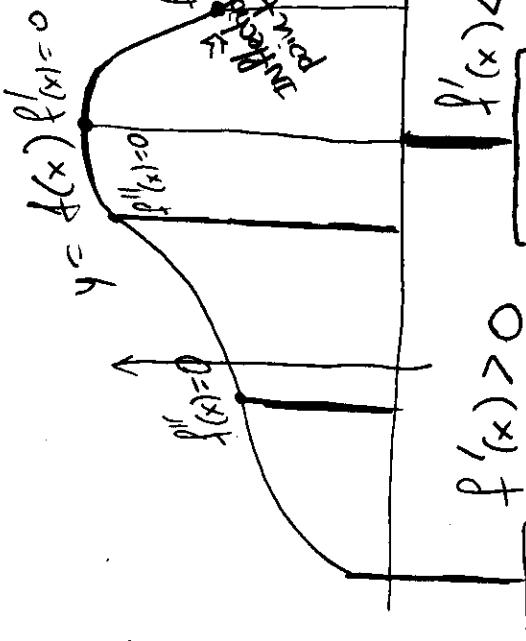


## Derivatives



## Tests:

increasing  $\Rightarrow f'(x) \geq 0$  increasing  $\Leftarrow f'(x) > 0$   
 constant  $\Leftrightarrow f'(x) \equiv 0$   
 decreasing  $\Rightarrow f'(x) \leq 0$  decreasing  $\Leftarrow f'(x) < 0$

max  $\Leftarrow f'(x) = 0$  and  $f''(x) > 0$   $x < x^*$   
 $f'(x) < 0$   $x > x^*$

min  $\Leftarrow f'(x) = 0$  and  $f''(x) < 0$   $x < x^*$   
 $f'(x) > 0$   $x > x^*$

max  $\Leftarrow f'(x) = 0$  and  $f''(x) > 0$   
 $f''(x) < 0$  min  $\Leftarrow f'(x) = 0$  and  $f''(x) < 0$

concave up  $\Rightarrow f''(x) \geq 0$  concave up  $\Leftarrow f''(x) > 0$   
 inflection point  $\Leftrightarrow f''(x) = 0$

concave down  $\Rightarrow f''(x) \leq 0$  concave down  $\Leftarrow f''(x) < 0$

END POINT	$f'(x) > 0$	$f'(x) < 0$	First derivative	END POINT	$f''(x) > 0$	$f''(x) < 0$	Second derivative	END POINT
	$\text{MAX } + \rightarrow -$	$\text{MIN } - \rightarrow +$	decreasing		$\text{MAX } + \rightarrow -$	$\text{MIN } - \rightarrow +$	increasing	
END POINT	$f'(x) > 0$	$f'(x) < 0$		END POINT	$f''(x) > 0$	$f''(x) < 0$		END POINT
			Increasing				Concave Up	
							Concave Down	