

7. (5 points) Consider the function f defined by $f(x) = x^3 - 3x + 1$ for $-2 \leq x \leq 2$. Show how to use concepts of calculus to identify the intervals on which f is increasing, the intervals on which f is decreasing, and all relative maxima and minima. Specify the intervals where $f'(x)$ is positive and specify the intervals where $f'(x)$ is negative. Sketch a graph of f . Clearly state your conclusions.

$$f'(x) = 3x^2 - 3$$

$$f'(x) = 0 \text{ if } 3x^2 - 3 = 0 \checkmark$$

$$f'(x) = 0 \text{ if } x^2 - 1 = 0$$

$$\text{So, } f'(x) = 0 \text{ if } x = \pm 1 \checkmark$$

x	-2	$-2 < x < -1$	-1	$-1 < x < 1$	1	$1 < x < 2$	2
$f(x)$	-1	$\uparrow$	3	$\downarrow$	-1	$\uparrow$	3
$f'(x)$		+	0	-	0	+	

relative maximum of 3
occurs at -1 and 2
relative minimum of -1
occurs at -2 and 1.

f is increasing on
 $(-2, 1)$ and $(1, 2)$
 f is decreasing on $(-1, 1)$
 $f'(x) > 0$ on $(-2, 1)$ and $(1, 2)$
 $f'(x) < 0$ on $(-1, 1)$.

