

- NOTE! 6. (7 points) Suppose $f(x) = -x^3 + 12x + 5$ for $0 \leq x \leq 4$. Show how to use calculus to find the critical values and help you identify the interval(s) on which the function is increasing and the interval(s) on which the function is decreasing. Sketch the graph of the function on the grid in Figure 2. Identify the relative extreme values of the function and specify where those values occur.

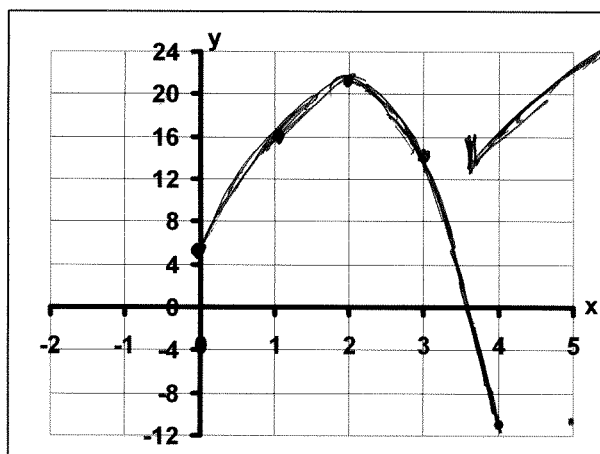


Figure 2

Find the critical values

$$f'(x) = -3x^2 + 12 \quad \text{for } 0 \leq x \leq 4$$

$$f'(x) = 0 \text{ when } -3x^2 + 12 = 0$$

$$x^2 = 4$$

$$x = \pm 2$$

The only critical value in $(0, 4)$ is 2.

Examine $f(x)$ and $f'(x)$ over $(0, 4)$

	$x=0$	$0 < x < 2$	$x=2$	$2 < x < 4$	$x=4$
$f(x)$	5	↑	21	↓	-11
$f'(x)$	12	+	0	-	36

So, $f(x)$ is increasing on $(0, 2)$ and $f(x)$ is decreasing on $(2, 4)$.

$f(2) = 21$ is the absolute maximum value and $f(4) = -11$ is the absolute minimum value.

$$\begin{array}{r} -64 \\ 48 \\ \hline -16 \\ -11 \end{array}$$