A Fill in the Blanks

PROBLEM

The function $y = 2x^2 - \ln|x|$ is monotonically increasing for values of $x(\neq 0)$ satisfying the inequalities ..... and monotonically decreasing for values of x satisfying the inequalities ..... ***(1983 - 2 Marks)***

SOLUTION

$$y = 2x^2 - \ln|x| \Rightarrow \frac{dy}{dx} = 4x - \frac{1}{x} = \frac{(2x+1)(2x-1)}{x}$$

Critical points are $0, 1/2, -1/2$

Clearly $f(x)$ is increasing on $\left(-\frac{1}{2}, 0\right) \cup \left(\frac{1}{2}, \infty\right)$ and

$f(x)$ is decreasing on $\left(-\infty, -\frac{1}{2}\right) \cup \left(0, \frac{1}{2}\right)$.