HUM 475

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$Y = 6A^3 - 3B^2 - 441A + 162B + 36$

Taking partial derivative with respect to A and B;

$$\frac{\partial Y}{\partial A} = 18A^2 - 441$$

and $\frac{\partial Y}{\partial B} = -9B^2 + 162$

again, $\frac{\partial^2 Y}{\partial A^2} = 36A$

and $\frac{\partial^2 Y}{\partial B^2} = -18B$

so, in order to find the critical points,

$$\frac{\partial Y}{\partial A} = 0$$

$\Rightarrow 18A^2 - 441 = 0$

$\Rightarrow A = \pm\sqrt{\frac{441}{18}} = \pm\frac{7}{\sqrt{2}}$

and $\frac{\partial Y}{\partial B} = 0$

$\Rightarrow -9B^2 + 162 = 0$

$\Rightarrow B = \pm 3\sqrt{2}$

Plugging these values into $\frac{\partial^2 Y}{\partial A^2}$ and $\frac{\partial^2 Y}{\partial B^2}$ we get,

$$\frac{\partial^2 Y}{\partial A^2} = \pm \frac{252}{7} \text{ and } \frac{\partial^2 Y}{\partial B^2} = \mp 54\sqrt{2}$$

At, $(A,B) = \left(\frac{7}{\sqrt{2}}, -3\sqrt{2}\right)$, $\frac{\partial^2 Y}{\partial A^2} \frac{\partial^2 Y}{\partial B^2} > 0$

so, $\left(\frac{7}{\sqrt{2}}, -3\sqrt{2}\right)$ is a relative ~~mim~~ minimum

At $(A,B) = \left(-\frac{7}{\sqrt{2}}, 3\sqrt{2}\right)$, $\frac{\partial^2 Y}{\partial A^2} \cdot \frac{\partial^2 Y}{\partial B^2} > 0$

so, $\left(\frac{-7}{\sqrt{2}}, 3\sqrt{2}\right)$ is a relative ~~maximum.~~ minimum

At points $\left(\frac{7}{\sqrt{2}}, 3\sqrt{2}\right)$ and $\left(-\frac{7}{\sqrt{2}}, -3\sqrt{2}\right)$, $\frac{\partial^2 Y}{\partial A^2} \cdot \frac{\partial^2 Y}{\partial B^2} < 0$.

so, these points are relative maximum.