

"QUIZ" for Lecture 10

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E-MAIL SCANNED .pdf OF COMPLETED QUIZ to DrZcalc3@gmail.com (Attachment: q10FirstLast.pdf) ASAP BUT NO LATER THAN Oct. 8, 8:00pm

1. Find the local maximum and minimum point(s), the local maximum and minimum values, and saddle point(s) of the function

$$f(x, y) = 12x^2 - 4x^3 + 6y^2 + 12xy$$

$$f_x = 24x - 12x^2 + 12y \Rightarrow 0 = 24x - 12x^2 + 12y$$

$$f_{xx} = 24 - 24x$$

$$f_y = 12y + 12x \Rightarrow 0 = 12y + 12x$$

$$f_{yy} = 12$$

$$f_{xy} = 12$$

$$\Rightarrow 0 = 12y + 12x$$

$$12y = -12x$$

↓

$$0 = 24x - 12x^2 - (-12x)$$

$$0 = 12x - 12x^2$$

$$12x^2 = 12x$$

$$x = \{0, 1\} \Rightarrow \text{critical points: } (0, 0) \text{ and } (1, -1)$$

$$f_{xx}(0, 0) = 24 - 0 = 24$$

$$f_{xx}(1, -1) = 24 - 24 = 0$$

$$f_{xy}(0, 0) = f_{xy}(1, -1) = 12$$

$$f_{yy}(0, 0) = f_{yy}(1, -1) = 12$$

$$D = f_{xx}f_{yy} - [f_{xy}]^2 = (24 \cdot 12) - (12^2) = + \text{ for } (0, 0)$$

$$(0 \cdot 12) - (12^2) = - \text{ for } (1, -1)$$

FOR (0, 0): $D > 0$ and $f_{xx} > 0$ ∴ LOCAL MINIMUM at (0, 0)

FOR (1, -1): $D < 0$

∴ SADDLE POINT at (1, -1)

NO MAXIMA OR OTHER LOCAL MINIMS OR SADDLE POINTS

$$\frac{75}{30} - \frac{25}{6} + \frac{42}{6}$$

$$75 - 150 + 252$$