Assessment 3 Part B

Michael Le

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Q11).

(a) $\frac{\partial f}{\partial x} = \frac{\partial}{\partial x}\left(e^{2ax-x^2+by} + b\ln(2-y)\right)$ $\boxed{\begin{matrix} a=9 \\ b=9 \end{matrix}}$

$= (2a-2x)\, e^{2ax-x^2+by}$

chain-rule.

$\frac{\partial f}{\partial y} = \frac{\partial}{\partial y}\left(e^{2ax-x^2+by} + b\ln(2-y)\right)$

chain rule + product rule.

$= b e^{2ax-x^2+by} + b\frac{1}{(2-y)}(-1)$

$= b e^{2ax-x^2+by} - \frac{b}{2-y}$

(b). Let $g(x) = f(x,1)$

i). $g(x) = f(x,1) = e^{2ax-x^2+b}$ ~~$+b(2-1)$~~ loge

$+ b\ln(2-1)$

$= e^{2ax-x^2+b}$

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Q11) b ii).

$$g'(x) = \frac{d}{dx} g(x) \quad \text{(chain-Rule)}$$

$$= (2a-2x)\, e^{2ax-x^2+b}$$

$$g'(x)=0 \Rightarrow (2a-2x)\, \cancel{e^{2ax-x^2+b}}$$ term gone as

$$2a-2x=0$$
$$2x=2a$$
$$x=a$$
$$a=9$$

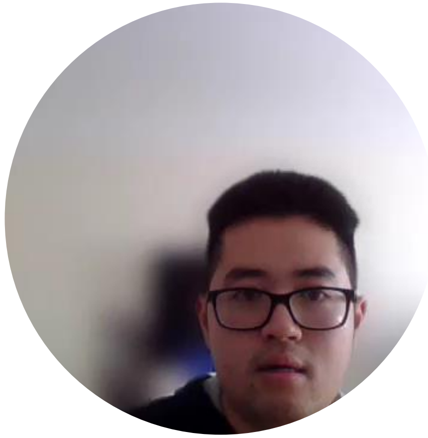
$$x=9$$
$$g(a) = e^{2a^2-a^2+b}$$
$$= e^{a^2+b}$$

$(9, e^{a^2+b})$ stationary point.

$(9, e^{9^2+9})$, $(9, e^{90})$ using ID last 2-digits.

Q11b) iii. since $g(x)>0$, it is a local maximum (~~...~~ Global maximum)

Q11c). Suppose that (next page)



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$$\cancel{\frac{\partial f}{\partial x}(1,1) = (2a-2)e^{2a-1+b} + \ln 1}$$

$$\cancel{\frac{\partial f}{\partial x}(1,1) = (2a-2)e^{2a-1+b} > 0}$$

$$\cancel{\frac{\partial f}{\partial y}(1,1) = e^{2a-1+b} - \frac{1}{2-y} > 0}$$

$$\cancel{= e^{2a+b-1} + \frac{1}{y-2} > 0}$$

Suppose that,

$$\frac{\partial f}{\partial x}(1,1) = (2a-2)\, e^{2a-1+b} = 2(a-1)\, e^{2a-1+b}$$

$$\frac{\partial f}{\partial y}(1,1) = b\, e^{2a-1+b} - \frac{b}{1}$$

$$= b\left(e^{2a-1+b} - 1\right)$$

By comparison, we increase y to improve efficiency.