LMA320 Flervariabelanalys

Förslag till svar på gamla tentor (MAL600)

10 jan 05 $\underline{1.}$ $(x,y,z) = (1,1,1) + t(2,-1,-1)$

$\underline{2.}$ a) $z(x,y) = g(y^2 + 2xy)$ b) $z = (y^2+2xy)^2$

$\underline{3.}$ lok. min. $= 0$ i $(0,y)$ $\forall y$; lok. max. $= e^{-1}$ i $(\pm 1, 0)$.

$\underline{4.}$ $f_{max} = 4 = f(1, \frac{3}{2})$, $f_{min} = -4 = f(-1, -\frac{3}{2})$.

$\underline{5.}$ $\frac{7}{4} - 2\ln 2$ $\underline{6.}$ $\ln 2$ $\underline{7.}$ $-\frac{1}{6} + e - \frac{1}{2}e^2$

16 aug 04 $\underline{1.}$ -3 $\underline{2.}$ $r z'_r$ $\underline{3.}$ lok. min. $= -\frac{1}{8}$ i $\pm(\frac{1}{2}, \frac{1}{2})$,

lok. max. $= \frac{1}{8}$ i $\pm(\frac{1}{2}, -\frac{1}{2})$ (sadelpunkter $(0,0)$, $(\pm 1, 0)$, $(0, \pm 1)$)

$\underline{4.}$ $f_{max} = 90 = f(0,-1)$, $f_{min} = -54 = f(-\frac{3}{2}, 0)$ $\underline{5.}$ $\frac{\pi}{8}$

$\underline{6.}$ $42\sin 5 + 14\sin 9 + 2\cos 5 - 2\cos 9$ $\underline{7.}$ $\frac{\pi}{4}$

$\underline{8.}$ $\vec{v} = (\pm 1, 0), (0, \pm 1)$ el. $\pm(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}})$. f ej diff.bar i $(0,0)$.

4 juni 04 $\underline{1.}$ $(x,y,z) = (1,-1,2) + t(26,44,9)$.

$\underline{3.}$ lok. min. $= -2$ i $(1,0)$, lok. max. $= 2$ i $(-1,0)$
(sadelpunkter $\pm(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}})$)

$\underline{4.}$ $f_{min} = 0 = f(1,0,0)$ (t.ex.) $f_{max} = \frac{1}{3} = f(\frac{1}{\sqrt[3]{3}}, \frac{1}{\sqrt[3]{3}}, \frac{1}{\sqrt[3]{3}})$

$\underline{5.}$ $\frac{2\pi}{3} - \frac{2\ln 2}{\sqrt{3}}$ $\underline{6.}$ $2(e^2 - e)$ $\underline{7.}$ $-\frac{7}{12}$

$\underline{8.}$ a) Ja b) Nej

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17 jan 06 <u>1.</u> $a=2, b=3, c=0$ <u>2.</u> a) $2vz'_v = z$

b) $z = \sqrt{xy}\, f\left(\frac{x}{y}\right)$, f C^1 <u>3.</u> $\lim_{x^2+y^2\to\infty} f(x,y) = 0$;

$f_{max} = \frac{1}{\sqrt{2}} = f\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$, $f_{min} = -\frac{1}{\sqrt{2}} = f\left(-\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}\right)$

<u>4.</u> Största värde saknas, $f_{min} = 2\sqrt{2} = f(\sqrt{2}, 2)$

<u>5.</u> $\frac{\pi}{6}$ <u>6.</u> $\frac{\pi}{2}(1-\ln 2)$ <u>7.</u> $-\frac{8}{5}$

18 aug 05 <u>1.</u> $9x - 12y + 4z = 0$ <u>2.</u> a) $z = \frac{1}{2}(x^2-y^2) + f(xy)$

b) $z = \frac{1}{2}(1 + x^2 - y^2 - x^2y^2)$ <u>3.</u> $\lim_{x^2+y^2\to\infty} f(x,y) = 0$;

$f_{max} = \frac{1}{e} = f(\pm 1, 0)$, $f_{min} = -\frac{3}{e} = f(0, \pm 1)$

<u>4.</u> $f_{max} = \frac{4}{\sqrt{14}} = \frac{2\sqrt{14}}{7}$ för $(x^2, y^2) = \frac{(3,1)}{\sqrt{14}}$, $f_{min} = \frac{1}{\sqrt{2}} = f\left(0, \pm\frac{1}{\sqrt[4]{2}}\right)$

<u>5.</u> $\frac{1}{2}$ <u>6.</u> -9π <u>7.</u> 0

27 maj 05 <u>1.</u> $2x - 2y + 3z = 9$ resp. $20x + 4y - z = 35$

<u>2.</u> a) $z = x^2 + f(xy)$ b) $z = x^2 + xy - x^2y^2$

<u>3.</u> $\lim_{x^2+y^2\to\infty} f(x,y) = 0$; $f_{max} = e^{-\frac{1}{2}} = f\left(\frac{1}{2}, \frac{1}{2}\right)$, $f_{min} = -e^{-\frac{1}{2}} = f\left(-\frac{1}{2}, -\frac{1}{2}\right)$

(dessa är de enda stationära punkterna)

<u>4.</u> $f_{max} = \frac{1}{2} = f(1,0)$, $f_{min} = -\frac{1}{2} = f(-1,0)$ <u>5.</u> $\frac{175}{48}$

<u>6.</u> $\frac{\pi}{4}(4 - \ln 5)$ <u>7.</u> a) $\vec{F} = \nabla\left(-\frac{1}{2}\left(\frac{1}{x^2} + e^{-x^2-y^2} + \frac{1}{y^2+1}\right)\right)$ b) 0