

Part I

1 a) 0, 1 0

b) $\begin{pmatrix} 9 & 3 \\ 3 & 1 \end{pmatrix}$ $Q(x,y) = 9x^2 + 6xy + y^2$

semi-positively

c) $\ln(xy)$

d) accumulation; $1 < x^2 + y^2 < 3$

$$\iint_{\Omega} 1 \, dy \, dx = 2\pi$$

e) $x^2 + y^2 \leq 1$; Weierstrass.

f) $f(x) = |x-2|$.

g) $-\frac{1}{2}$; 0; is not continuous at (0,0).

h) 3

i) 0;

$$x \frac{\partial f}{\partial x}(x, y) + y \cdot \frac{\partial f}{\partial y}(x, y) = 0.$$

$$j) \frac{df}{dt}(t) = 2t e^{2t} (1+t^2)^3 + 6t^3 e^{2t} (1+t^2)^2$$

k) minimum

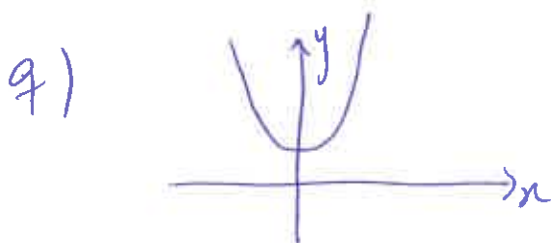
$$l) \int_0^2 \int_0^{x^2} e^{x+3y} dy dx = \int_0^4 \int_{\sqrt{y}}^2 e^{x+3y} dx dy$$

m) 0; 0; 0;

$$n) \begin{cases} y'' = -\cos x \\ y(\pi/4) = \sqrt{2}/2 \\ y'(0) = 0 \end{cases}$$

o) 7; 4

p) Malthus; $p(10) = 10e^{-10}$; 0



$$y(x) = \frac{3}{2}x^2 + 2.$$