

10pts
①

$$f(x,y) = \sqrt{x^2 + y^2}$$

level curve: $f(x,y) = c$

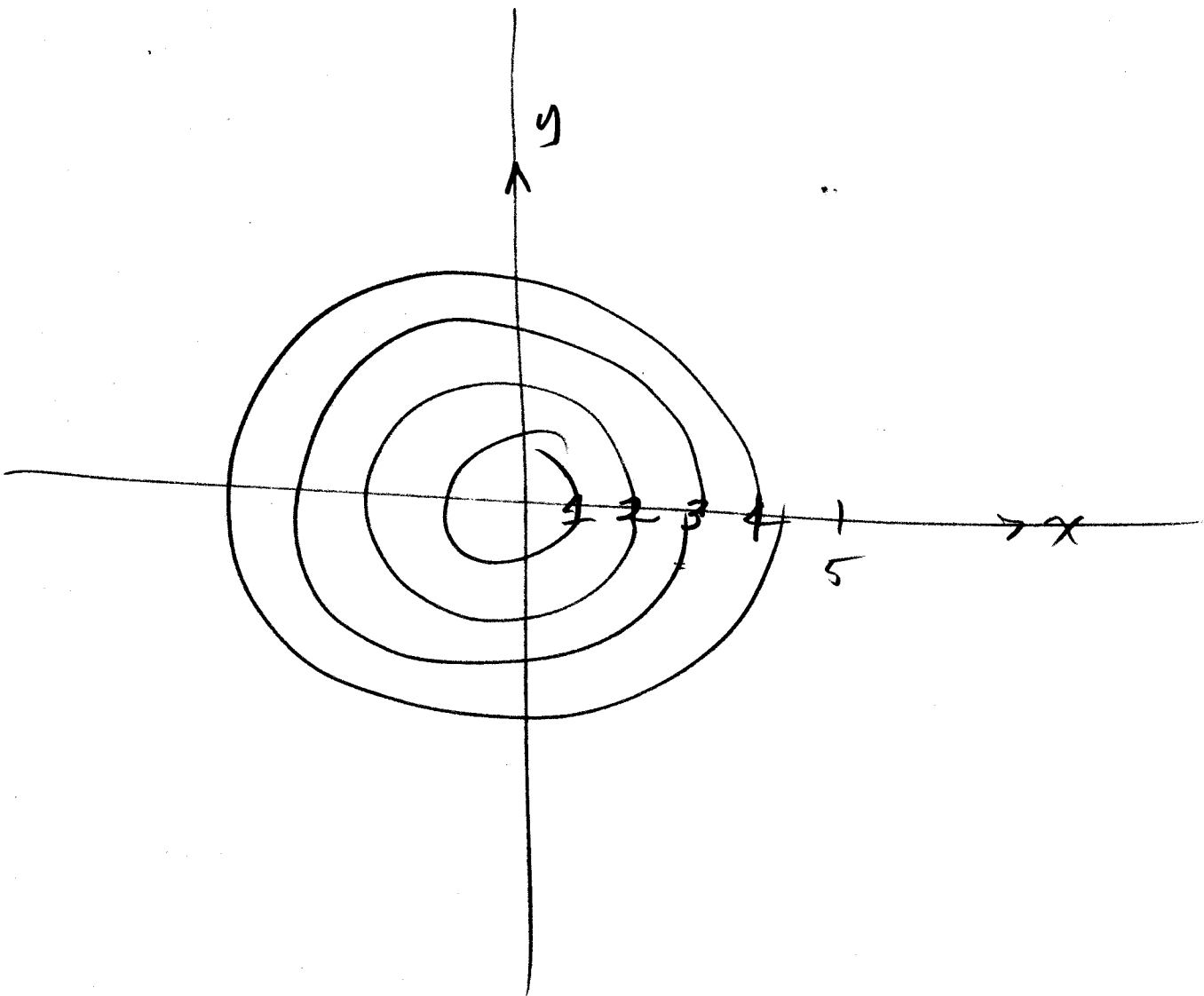
$$\sqrt{x^2 + y^2} = c$$

$$x^2 + y^2 = c^2$$

Quiz #6

35

For $c = 1, 2, 3,$ and $4,$ we get these level curves.



5pts

$$(2a) f(x,y) = e^{2x} \cos 3y$$

$$\frac{\partial f}{\partial x} = \frac{\partial}{\partial x} e^{2x} \cos 3y$$

$$= \cos 3y \frac{\partial}{\partial x} e^{2x}$$

$$= (\cos 3y) e^{2x} \frac{\partial}{\partial x} 2x$$

$$= 2e^{2x} \cos 3y$$

$$\frac{\partial f}{\partial y} = \frac{\partial}{\partial y} e^{2x} \cos 3y$$

$$= e^{2x} \frac{\partial}{\partial y} \cos 3y$$

$$= e^{2x} (-\sin 3y) \frac{\partial}{\partial y} (3y)$$

$$= -3e^{2x} \sin 3y$$

5 pts

24

$$f(x, y) = x \ln(xy)$$

$$\frac{\partial f}{\partial x} = \frac{\partial}{\partial x} [x \ln(xy)]$$

$$= x \frac{\partial}{\partial x} \ln(xy) + \left(\frac{\partial}{\partial x} x \right) \ln(xy)$$

$$= x \cdot \frac{1}{xy} \frac{\partial}{\partial x} (xy) + 1 \cdot \ln(xy)$$

$$= \frac{1}{y} \cdot \cancel{y} \frac{\partial}{\partial x} x + \ln(xy)$$

$$= 1 + \ln(xy)$$

$$\frac{\partial f}{\partial y} = \frac{\partial}{\partial y} [x \ln(xy)]$$

$$= x \frac{\partial}{\partial y} \ln(xy)$$

$$= x \left[\frac{1}{xy} \frac{\partial}{\partial y} xy \right]$$

$$= \frac{1}{y} \cdot x \frac{\partial}{\partial y} y$$

$$= \frac{1}{y} \cdot x \cdot 1$$

$$= \frac{x}{y}$$

5/13
③

$$x^2 + y^2 + z^2 = xyz$$

$$z = f(x, y)$$

$$2x + 0 + 2z z_x = y [x z_x + 1 \cdot z]$$

$$2x + 2z z_x = xy z_x + yz$$

$$2z z_x - xy z_x = yz - 2x$$

$$(2z - xy) z_x = yz - 2x$$

$$z_x = \frac{yz - 2x}{2z - xy}$$

$$0 + 2y + 2z z_y = x [y z_y + 1 \cdot z]$$

$$2y + 2z z_y = xy z_y + xz$$

$$2z z_y - xy z_y = xz - 2y$$

$$(2z - xy) z_y = xz - 2y$$

$$z_y = \frac{xz - 2y}{2z - xy}$$

10pts
① $f(x, y) = 9 - x^2 + xy - 2y^2$

$$f(2, 1) = 9 - 4 + 2 - 2 = 5$$

$$f_x(x, y) = -2x + y$$

$$f_x(2, 1) = -4 + 1 = -3$$

$$f_y(x, y) = x - 4y$$

$$f_y(2, 1) = 2 - 4 = -2$$

$$L(x, y) = f(2, 1) + f_x(2, 1)(x - 2) + f_y(2, 1)(y - 1)$$

$$L(x, y) = 5 - 3(x - 2) - 2(y - 1)$$

$$L(x, y) = 5 - 3x + 6 - 2y + 2$$

$$L(x, y) = 13 - 3x - 2y$$