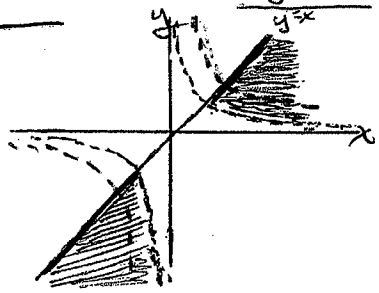
Answers Part 4

1. $D_f: \{(x,y): y>0 \text{ and } x\neq 0\}$

$D_g: \{(x,y): x\geq 1 \text{ and } y\neq x\}$ $\quad g(5,2)=-\frac{2}{3}$

$y\leq x$ and $xy-1>0 \Rightarrow y>\frac{1}{x}$ if $x>0$ or $y<\frac{1}{x}$ if $x<0$



and $xy\neq 2 \Rightarrow y\neq \frac{2}{x}$

2. $f_x = 5(3x+xy^2)^4(3+y^2)$ $\quad f_y = 5(3x+xy^2)^4 2xy$

$\frac{\partial z}{\partial x} = 2xe^{x+3y} + e^{x+3y}x^2$ $\quad \frac{\partial z}{\partial y} = x^2e^{x+3y}(3)+1$

$\frac{\partial f}{\partial x} = \frac{1}{2y+3x}\cdot 3$ $\quad \frac{\partial f}{\partial y} = \frac{1}{2y+3x}\cdot 2$

$\frac{\partial f}{\partial x} = 6x-5y$ $\quad \frac{\partial f}{\partial y} = -5x+2$

$f_x = \frac{1}{y}+2x$ $\quad f_y = -\frac{x}{y^2}$ $\quad f_{xx}=2$ $\quad f_{yy}=\frac{2x}{y^3}$ $\quad f_{yx}=-\frac{1}{y^2}$

$f_x = 2xy\ln(x^2+y^2) + \frac{1}{x^2+y^2}\cdot 2x\cdot x^2y$

$f_y = x^2\ln(x^2+y^2) + \frac{1}{x^2+y^2}\cdot 2y\cdot x^2y$

$g_x = \frac{ye^{x^2} - e^{x^2}2xxy}{(e^{x^2})^2}$ $\quad g_y = \frac{x}{e^{x^2}}$

$\frac{\partial h}{\partial x} = (y^2-2)e^{yz}$ $\quad \frac{\partial h}{\partial y} = (2xy)e^{yz} + e^{yz}z(xy^2-2x)$

$\frac{\partial h}{\partial z} = (xy^2-2x)e^{yz}y$

$\frac{\partial z}{\partial x} = 2y\cdot 3x^2 + 5y^3$ $\quad \frac{\partial^2 z}{\partial x^2} = 2y\cdot 6x$ $\quad \frac{\partial^2 z}{\partial y\partial x} = 6x^2+15y^2$

3. $f_{xx} = ye^{xy}y$ $\quad f_{yy} = xe^{xy}x$ $\quad f_{xy} = e^{xy} + e^{xy}xy$

4. saddle point $(1,2)$
local min $(2,2)$

local max at $(3,-1)$

local min $(0,0)$
saddle point $(-1,\sqrt{2})$
saddle point $(-1,-\sqrt{2})$

5. $x=2500 \quad y=2000 \quad P(x,y)=5,000,000$

6. $300 \times 150 = 45,000 \text{ ft}^2$

7. (a) 4 dolls with red hair
11 dolls with black hair

(b) \$262

8. $x=4, y=4, z=2 \quad$ Max. value $= f(4,4,2) = 48$