Section 10.3

1.) $f(x,y) = x^2y + xy^2 \xrightarrow{D}$

$\frac{\partial f}{\partial x} = 2xy + y^2$ and $\frac{\partial f}{\partial y} = x^2 + x \cdot 2y$

3.) $f(x,y) = (xy)^{3/2} - (xy)^{2/3} \longrightarrow$

$\frac{\partial f}{\partial x} = \frac{3}{2}(xy)^{1/2} \cdot y - \frac{2}{3}(xy)^{-1/3} \cdot y$ and

$\frac{\partial f}{\partial y} = \frac{3}{2}(xy)^{1/2} \cdot x - \frac{2}{3}(xy)^{-1/3} \cdot x$

6.) $f(x,y) = \tan(x-2y) \xrightarrow{D}$

$\frac{\partial f}{\partial x} = \sec^2(x-2y) \cdot (1)$ and $\frac{\partial f}{\partial y} = \sec^2(x-2y) \cdot (-2)$

7.) $f(x,y) = \cos^2(x^2-2y) \xrightarrow{D}$

$\frac{\partial f}{\partial x} = 2\cos(x^2-2y) \cdot -\sin(x^2-2y) \cdot 2x$ and

$\frac{\partial f}{\partial y} = 2\cos(x^2-2y) \cdot -\sin(x^2-2y) \cdot (-2)$

9.) $f(x,y) = e^{\sqrt{x+y}} \xrightarrow{D}$

$\frac{\partial f}{\partial x} = e^{\sqrt{x+y}} \cdot \frac{1}{2}(x+y)^{-1/2} \cdot (1)$ and

$\frac{\partial f}{\partial y} = e^{\sqrt{x+y}} \cdot \frac{1}{2}(x+y)^{-1/2}(1)$

10.) $f(x,y) = x^2 e^{-\frac{1}{2}xy} \xrightarrow{D}$

$\frac{\partial f}{\partial x} = x^2 \cdot e^{-\frac{1}{2}xy} \cdot (\frac{-1}{2}y) + 2x \cdot e^{-\frac{1}{2}xy}$ and

$\frac{\partial f}{\partial y} = x^2 \cdot e^{-\frac{1}{2}xy} \cdot (\frac{-1}{2}x)$

13.) $f(x,y) = \ln(2x+y) \xrightarrow{D}$

$\frac{\partial f}{\partial x} = \frac{1}{2x+y} \cdot (2)$ and $\frac{\partial f}{\partial y} = \frac{1}{2x+y} \cdot (1)$

17.) $f(x,y) = 3x^2 y - 2y^2 \xrightarrow{D}$

$f_x = 6x$ so $f_x(1,0) = 6(1) = 6$

19.) $g(x,y) = e^{x+3y} \xrightarrow{D}$

$g_y = e^{x+3y} \cdot (3)$ so $g_y(2,1) = 3e^{2+3(1)} = 3e^5$

22.) $g(v,w) = \frac{w^2}{v+w} \xrightarrow{D}$

$g_v = \frac{(v+w)(0) - w^2(1)}{(v+w)^2} = \frac{-w^2}{(v+w)^2}$ so

$g_v(1,1) = \frac{-(1)^2}{(1+1)^2} = \frac{-1}{4}$

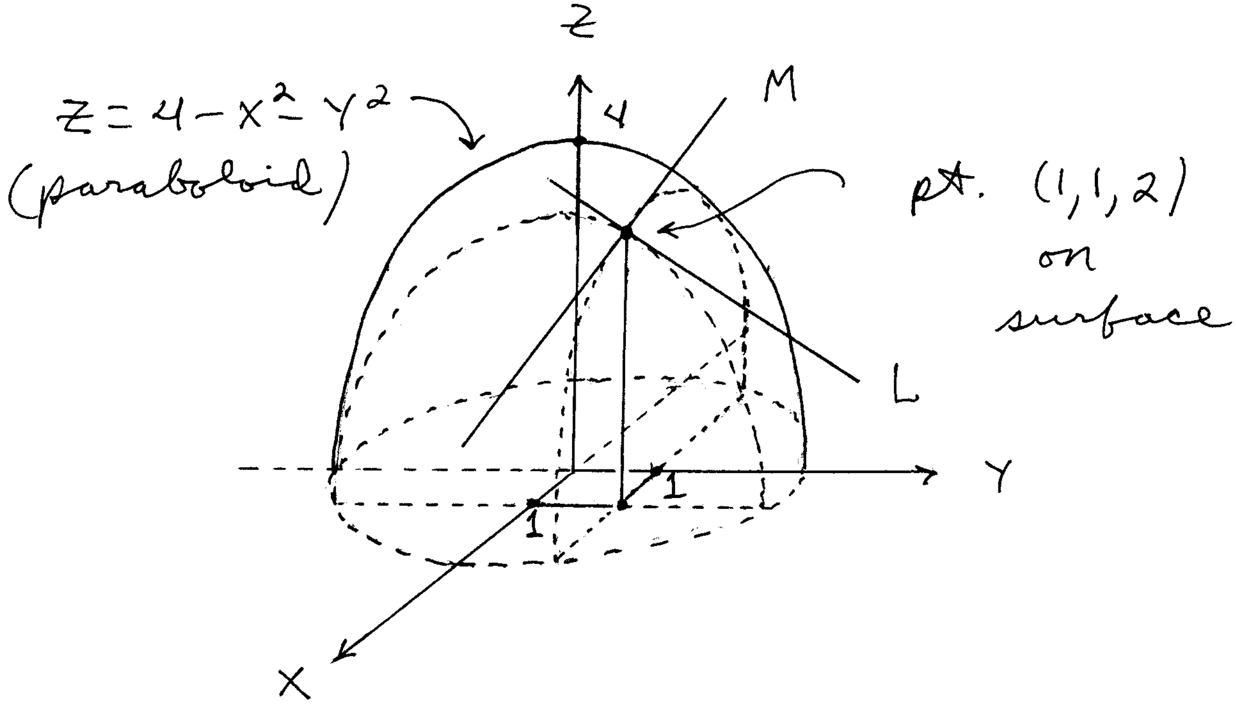
23.) $f(x,y) = \frac{xy}{x^2+2} \xrightarrow{D}$

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

$f_x(-1,2) = \frac{(1+2)(2) - (-2)(-2)}{(1+2)^2} = \frac{2}{9}$

25.) $f(x,y) = 4 - x^2 - y^2 \xrightarrow{D}$

$f_x = -2x$ and $f_y = -2y$ so



$f_x(1,1) = -2$ is slope of line M
(tangent to surface in positive X-direction) , and
$f_y(1,1) = -2$ is slope of line L
(tangent to surface in positive Y-direction)

30.) Per capita growth rate

$$f(P,H) = \frac{1}{H}\frac{dH}{dt} = r\left(1 - \frac{H}{K}\right) - aP$$

b.) If $P \uparrow$, then $\frac{\partial f}{\partial P} = -a$ so per capita growth rate is $\downarrow$.

a.) If $H \uparrow$, then $\frac{\partial f}{\partial H} = r \cdot \left(\frac{-1}{K}\right) = \frac{-r}{K}$ so per capita growth rate is $\downarrow$.

39.) $f(x,y) = x^2y + xy^2 \xrightarrow{D}$

$\frac{\partial f}{\partial x} = 2xy + y^2 \xrightarrow{D} \frac{\partial^2 f}{\partial x^2} = 2y$

40.) $f(x,y) = xy^2 - 3y^3 \xrightarrow{D}$

$\frac{\partial f}{\partial y} = 2xy - 9y^2 \xrightarrow{D} \frac{\partial^2 f}{\partial y^2} = 2x - 18y$

41.) $f(x,y) = xe^y \xrightarrow{D}$

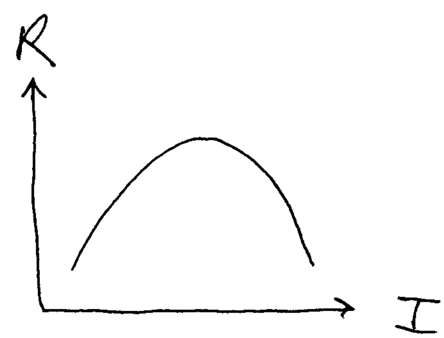
$\frac{\partial f}{\partial y} = xe^y \xrightarrow{D} \frac{\partial^2 f}{\partial x \partial y} = e^y$

42.) $f(x,y) = \sin(x-y) \xrightarrow{D}$

$\frac{\partial f}{\partial x} = \cos(x-y)\cdot(1) \xrightarrow{D} \frac{\partial^2 f}{\partial y \partial x} = -\sin(x-y)(-1)$

51.) Let R: Crop Growth Rate,
I: Leaf area Index,
S: Percent of Full Sunlight

Fixed S



Fixed
I