Math 108 - Prof. Richard B. Goldstein - Chap 8 HW - Barnett 10th Ed

Sect 8.1

#7 $g(3,-3) = \dfrac{88}{(3)^2+3(-3)} = \dfrac{88}{0}$ D.N.E.

#27 $f(x,y) = x^2+2y^2$

$\dfrac{f(x+h,y)-f(x,y)}{h} = \dfrac{(x+h)^2+2y^2-[x^2+2y^2]}{h} = \dfrac{x^2+2xh+h^2+2y^2-x^2-2y^2}{h}$

$= \dfrac{2xh+h^2}{h} = \underline{\underline{2x+h}}$ (as long as $h \neq 0$)

#42 $R(x,y) = px+qy = (230-9x+y)x + (130+x-4y)y$

$R(10,15) = 155(10) + 80(15) = \$\underline{\underline{2,750}}$

$C(10,15) = 200 + 80(10) + 30(15) = \underline{\underline{1450}}$

$P(10,15) = 2,750 - 1,450 = \$\underline{\underline{1,300}}$

Sect 8.2

#11 $C(x,y) = -7x^2+10xy+4y^2-9x+8y+12$

$C_x(x,y) = \underline{\underline{-14x+10y \quad -9}}$

#15 $C_{xy}(x,y) = \dfrac{\partial}{\partial y}(C_x(x,y))$

$= \underline{\underline{10}}$

#37 $f(x,y) = \ln(x^2+y^2)$

$f_x(x,y) = \dfrac{1}{x^2+y^2} \cdot 2x = \underline{\underline{\dfrac{2x}{x^2+y^2}}}$ $\qquad f_y(x,y) = \dfrac{1}{x^2+y^2} \cdot 2y = \underline{\underline{\dfrac{2y}{x^2+y^2}}}$

#63 $P(x,y) = R(x,y) - C(x,y) = 80x+90y+0.04xy-0.05x^2-0.05y^2 - (8x+6y+20,000)$

$= 72x+84y+0.04xy-0.05x^2-0.05y^2-20,000$

$P_x = 72 + 0.04y - 0.1x \Big|_{(1200,1800)} = 72+72-120 = \underline{\underline{24}}$

$P_y = 84 + 0.04x - 0.1y \Big|_{(1200,1800)} = 84+48-180 = \underline{\underline{-48}}$

for each increase of type A (x) roughly a $\underline{\underline{\$24}}$ incr in profit

" " " " " B (y) " " $\underline{\underline{-\$48}}$ (loss) in profit

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Sect 8.3

#5 $f(x,y) = 6 - x^2 - 4x - y^2$

$f_x(x,y) = -2x - 4 = 0 \Rightarrow x = -2$

$f_y(x,y) = -2y = 0 \Rightarrow y = 0$

$f_{xx} = -2$, $f_{yy} = -2$, $f_{xy} = 0$ $\quad (-2)(-2) - 0^2 = 4 > 0$ $\therefore$ local max

Local max at $(-2, 0)$ of $f(-2,0) = 10$

#29 $P(x,y) = R(x,y) - C(x,y) = 2x + 3y - (x^2 - 2xy + 2y^2 + 6x - 9y + 5)$

$P_x = 2 - 2x + 2y - 6 = 0 \qquad -2x + 2y = 4$

$P_y = 3 + 2x - 4y + 9 = 0 \qquad 2x - 4y = -12$

$-2y = -8$

$y = 4$

$x = 2$

$P(2,2) = 16 - (1) = 15$ max $\qquad$ 2,000 type A, 4,000 type B, \$15 million

#31 (A) $x(10,12) = 116 - 300 + 240 = \boxed{56}$ $\qquad x(11,11) = 116 - 330 + 220 = \boxed{6}$

$y(10,12) = 144 + 160 - 288 = \boxed{16}$ $\qquad y(11,11) = 144 + 176 - 264 = \boxed{56}$

(B) $P = (116 - 30p + 20q)p + (144 + 16p - 24q)q - [6(116 - 30p + 20q) + 8(144 + 16p - 24q)]$

$P(p,q) = 168p - 30p^2 + 36pq + 216q - 24q^2 - 1848$

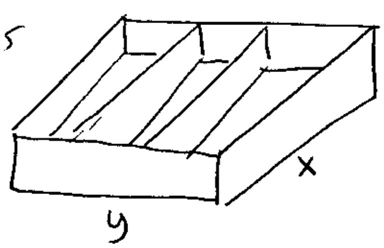
$P_p = 168 - 60p + 36q = 0 \qquad -60p + 36q = -168$

$P_q = +36p + 216 - 48q = 0 \qquad 36p - 48q = -216$

$p = 10$
$q = 12$

$P(10,12) = 56 \cdot 10 + 16 \cdot 12 - [6(56) + 8(16)] = 752 - 464 = 288$

#35



$V = xyz = 64 \qquad z = \frac{64}{xy}$

$A = 4xz + 2yz + xy$

$A = \frac{256}{y} + \frac{128}{x} + xy$

$A_x = -\frac{128}{x^2} + y = 0 \qquad x^2 y = 128$

$A_y = -\frac{256}{y^2} + x = 0 \qquad x y^2 = 256$

$x^4 y^2 = 128^2 = 16384$

$x y^2 = 256$ $\quad \div$

$x^3 = 64 \Rightarrow \boxed{x = 4}$

$\therefore\ 4^2 \cdot y = 128 \qquad \boxed{y = 8}$

$z = \frac{64}{4 \cdot 8} = 2 \qquad \boxed{z = 2}$

$A = \frac{256}{8} + \frac{128}{4} + 4 \cdot 8 = 32 + 32 + 32 = 96$ sq ft