

MATH 112 – EXAM II Hints and Answers  
Version Alpha  
Spring 2006

1. (a) (4 points) ANSWER:  $\frac{\partial z}{\partial x} = \frac{(x^2 + 3y)(4x^3y) - x^4y(2x)}{(x^2 + 3y)^2}$

(b) (4 points) ANSWER:  $\frac{\partial w}{\partial t} = (t \ln(r) + 1)e^{tr}r + e^{tr} \ln(r)$

(c) (6 points)

i. ANSWER:  $P_r(r, s) = 5s - \frac{30}{r^2}$ ;  $P_s(r, s) = 5r - \frac{25}{s^2}$

ii. HINT:  $P_r(2, 4)$  gives the instantaneous rate of change of profit if  $r$  is allowed to vary a small amount from  $r = 2$  and  $s$  is fixed at  $s = 4$ . Similarly,  $P_s(2, 4)$  is the instantaneous rate of change of profit if  $r$  is fixed at 2 and  $s$  varies a small amount from  $s = 4$ .

ANSWER: selling one more radish

(d) HINT:  $\frac{g(2, 3.0001) - g(2, 3)}{0.0001} \approx g_y(2, 3)$

ANSWER: -8

2. HINTS: The objective function is  $P(x, y) = 73x + 36y$ .

The constraints are

$$0.2x + 0.1y \leq 15.1$$

$$0.1x + 0.1y \leq 9.8$$

$$x \leq 60$$

The feasible region has five vertices:  $(0, 0)$ ,  $(0, 98)$ ,  $(53, 45)$ ,  $(60, 31)$ , and  $(60, 0)$ .

ANSWER:  $x = 60$ ,  $y = 31$

3. (a) (4 points) ANSWER:  $S(t) = -\frac{1}{3}t^3 + 13t^2 - 160t + 750$ ;  $S'(t) = -t^2 + 26t - 160$

(b) (3 points) HINT: Set  $S'(t) = 0$  and solve for  $t$ .

ANSWER:  $t = 10$  and  $t = 16$

(c) (3 points) HINT: Evaluate  $S(t)$  at  $t = 15$ ,  $t = 16$ , and  $t = 20$ .

ANSWER: largest = 152.67 feet per hour; smallest = 83.33 feet per hour

(d) (4 points) HINT: Set  $B'(t) = 0$  and solve for  $t$ .

ANSWER:  $t = 4$

(e) (3 points) HINT:  $B''(t) = \frac{1}{2\sqrt{t+5}} - \frac{1}{2}$ . Evaluate  $B''(4)$ .

ANSWER: local max