

Name _____

KEY

Math 254, Quiz #7, Summer 2012

Instructions: Show all work. Use exact answers unless asked to round.

1. Maximize
- $w=2x^2-15x+3y^2-4y+5xy$
- , subject to
- $2x+y=10$
- .

$$F(x,y,z,\lambda) = 2x^2 - 15x + 3y^2 - 4y + 5xy - 2x\lambda - y\lambda + 10\lambda$$

$$F_x = 4x - 15 + 5y - 2\lambda = 0$$

$$F_y = 6y - 4 + 5x - \lambda = 0$$

$$2x + y = 10$$

$$y = -2x + 10$$

$$y = -\frac{1}{2}\left(\frac{77}{8}\right) + 10 = \frac{40}{4} - \frac{77}{8} = \frac{-37}{4}$$

$$\left(\frac{77}{8}, -\frac{37}{4}\right)$$

$$\lambda = 6y - 4 + 5x$$

$$4x - 15 + 5y - 2(6y - 4 + 5x) = 0$$

$$4x - 15 + 5y - 12y + 8 - 10x = 0$$

$$-6x - 7 - 7y = 0$$

$$-6x - 7 - 7(-2x + 10) = 0$$

$$-6x - 7 + 14x - 70 = 0$$

$$8x - 77 = 0$$

$$x = \frac{77}{8}$$

2. Integrate.

a. $\int_0^2 \int_0^x 3xy \, dy \, dx$

$$\int_0^2 \frac{3xy^2}{2} \Big|_0^x \, dx = \int_0^2 \frac{3}{2}x^3 \, dx$$

$$= \frac{3}{8}x^4 \Big|_0^2 = \boxed{6}$$

b. $\int_0^1 \int_y^{y^3} e^y \, dx \, dy$

$$\int_0^1 e^y x \Big|_y^{y^3} \, dy = \int_0^1 y^3 e^y - y e^y \, dy = \int_0^1 (y^3 - y) e^y \, dy$$

	u	dv
+	$y^3 - y$	e^y
-	$3y^2 - 1$	e^y
+	$6y$	e^y
-	6	e^y
+	0	e^y

$$u = y^3 - y \quad dv = e^y$$

$$(y^3 - y)e^y - (3y^2 - 1)e^y + 6ye^y - 6e^y \Big|_0^1$$

$$e^1 \left[(1-1) - (3-1) + 6-6 \right] - 1 \left[0 - (-1) + 0 - 6 \right]$$

$$\boxed{-2e + 5}$$