

SIIT MAS 117 SUMMER 2006 QUIZ 3 SECTION 1

Circle your answer.

Prob.	Prob.	Prob.	Prob.
1	2	3	4
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5

SOLUTION

Problem 1. The absolute minimum of $f(x,y) = xy + y^2$ on the parabola $x = 2y^2$ occurs at the point

1. $(2/9, -1/3)$ **2.** $(0, 0)$ 3. $(-1/2, -1/8)$ 4. $(10, -7/3)$ 5. None of the above

The correct answer is 2.

Solving the system
$$\begin{cases} f_x(x,y) = \lambda g_x(x,y) \\ f_y(x,y) = \lambda g_y(x,y) \\ g(x,y) = 0 \end{cases} \Rightarrow \begin{cases} y = \lambda \\ x + 2y = -4\lambda y \\ x - 2y^2 = 0 \end{cases}$$

$$\begin{cases} x + 2y = -4y^2 \\ x - 2y^2 = 0 \end{cases} \Rightarrow x = 2y^2 \Rightarrow 2y^2 + 2y + 4y^2 = 0 \Rightarrow 2y(3y + 1) = 0 \Rightarrow \begin{cases} y = 0 \\ y = -1/3 \end{cases}$$

It follows that $\begin{cases} x = 0, y = 0 \\ x = 2/9, y = -1/3 \end{cases}$ Making the table of values of $f(x,y)$

(x,y)	$(0, 0)$	$(2/9, -1/3)$
$f(x,y)$	0	1/27

Problem 2. Evaluate $\int_0^1 \int_0^1 (6xy^2 - 2y) dy dx$

1. $5/3$ **2. 0** 3. -2 4. 1 5. None of the above

The correct answer is 2.

Integrating in y , $\int_0^1 (6xy^2 - 2y) dy = 2xy^3 - y^2 \Big|_0^1 = 2x - 1$ then

$$\int_0^1 (2x - 1) dx = x^2 - x \Big|_0^1 = (1 - 1) - 0 = 0$$

Problem 3. Evaluate $\int_0^2 \int_0^{\pi/2} 2x \cos y \, dy \, dx$

1. 0 2. 1 **3. 4** 4. $\pi/2$ 5. None of the above

The correct answer is 3.

$$\int_0^{\pi/2} 2x \cos y \, dy = 2x \sin y \Big|_0^{\pi/2} = (2x)(1) - (-2x)(0) = 2x$$

$$\int_0^2 2x \, dx = x^2 \Big|_0^2 = 4$$

Problem 4. Evaluate $\int_0^e \int_0^{1/x} 2x^2 y \, dy \, dx$

1. $1/2$ **2.** e 3. 0 4. -1 5. None of the above

The correct answer is 2.

$$\int_0^{1/x} 2x^2 y \, dy \, dx = x^2 y^2 \Big|_0^{1/x} = \frac{x^2}{x^2} - 0 = 1 - 0 = 1$$

$$\int_0^e 1 \, dx = x \Big|_0^e = e - 0 = e$$