

SIIT MAS 117 SUMMER 2006 QUIZ 3 SECTION 2

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 maximum of $f(x,y) = xy + x^2$ on the parabola $y = 3x^2$ occurs at the point

1. $(-2/9, 4/27)$ 2. $(0, 0)$ 3. $(-1/6, -5/12)$ 4. $(15, -17/3)$ 5. None of the above

The correct answer is 1.

$$\text{Solving the system } \begin{cases} f_x(x,y) = \lambda g_x(x,y) \\ f_y(x,y) = \lambda g_y(x,y) \\ g(x,y) = 0 \end{cases} \Rightarrow \begin{cases} y + 2x = 6\lambda x \\ x = -\lambda \\ 3x^2 - y = 0 \end{cases}$$

$$\begin{cases} y + 2x = -6x^2 \\ 3x^2 - y = 0 \end{cases} \Rightarrow y = 3x^2 \Rightarrow 3x^2 + 2x = -6x^2 \Rightarrow x(9x + 2) = 0 \Rightarrow \begin{cases} x = 0, y = 0 \\ x = -2/9, y = 4/27 \end{cases}$$

Making the table of values of $f(x,y)$

(x,y)	$(0, 0)$	$(-2/9, 4/27)$
$f(x,y)$	0	4/243

Problem 2. Evaluate $\int_{-1}^1 \int_0^1 (6x^2y - 3y^2) dx dy$

1. $5/3$

2. 0

3. -2

4. 1

5. None of the above

The correct answer is 3.

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

$$\int_{-1}^1 (2y - 3y^2) dy = y^2 - y^3 \Big|_{-1}^1 = (1-1) - [1 - (-1)] = -2$$

Problem 3. Evaluate $\int_0^1 \int_0^{\pi/2} 2x \sin y \, dy \, dx$

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

The correct answer is 2.

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

$$\int_0^1 2x \, dx = x^2 \Big|_0^1 = 1$$

Problem 4. Evaluate $\int_1^e \int_0^{1/x} 3x^2 y^2 dy dx$

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

The correct answer is 2.

$$\int_0^{1/x} 3x^2 y^2 dy = x^2 y^3 \Big|_0^{1/x} = 1/x$$

$$= \int_1^e \frac{1}{x} dx = \ln x \Big|_1^e = \ln e - \ln 1 = 1 - 0 = 1$$