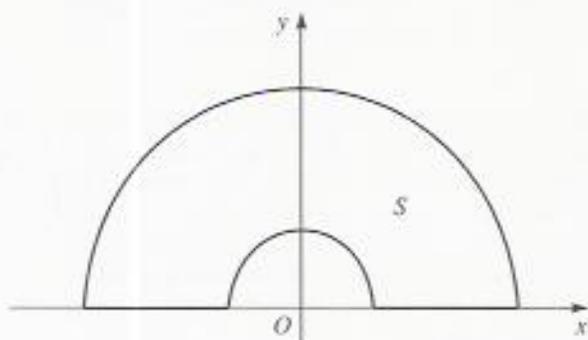


This assignment covers Units 27, 28, 29 and 30.

Unit 27

Questions 1 and 2



The surface integral of the function  $x^2 + y^2$  over the region  $S$  of the upper half-plane shown in the figure is to be evaluated using polar coordinates  $(r, \theta)$ , by integrating over  $r$  first and then integrating over  $\theta$ . The region  $S$  is the part of the upper half-plane bounded by arcs of the circles  $x^2 + y^2 = \frac{1}{4}\pi^2$  and  $x^2 + y^2 = \frac{9}{4}\pi^2$ .

- 1 Which TWO options give the lower and upper limits of the  $r$  integral?
- 2 Which TWO options give the lower and upper limits of the  $\theta$  integral?

*Handwritten notes:*  $x = 1 - y - z$   
 CF  
 AE

Options for Questions 1 and 2

- |         |                    |                    |                    |
|---------|--------------------|--------------------|--------------------|
| A 0     | B $\frac{1}{4}\pi$ | C $\frac{1}{2}\pi$ | D $\frac{3}{4}\pi$ |
| E $\pi$ | F $\frac{5}{2}\pi$ | G $2\pi$           | H $\frac{9}{4}\pi$ |

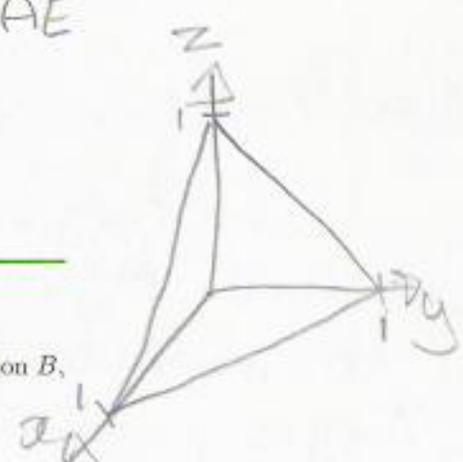
[Questions 1 and 2 both have TWO correct options.]

Questions 3 to 5

The volume integral of a three-dimensional scalar field  $f(x, y, z)$  over the region  $B$ , which is defined by the inequalities

$$x + y + z \leq 1, \quad x \geq 0, \quad y \geq 0 \quad \text{and} \quad z \geq 0,$$

is evaluated using Cartesian coordinates  $(x, y, z)$  by integrating over  $x$  first, then integrating over  $y$  and finally integrating over  $z$ .



- 3 What is the upper limit of the  $x$  integral?
- 4 What is the upper limit of the  $y$  integral?
- 5 What is the upper limit of the  $z$  integral?

*Handwritten notes:* A, D, F

$$\int_0^1 \int_0^{1-z} \int_0^{1-z-y} f \, dx \, dy \, dz$$

Options for Questions 3 to 5

- |           |           |           |             |
|-----------|-----------|-----------|-------------|
| A 1       | B $1-x$   | C $1-y$   | D $1-z$     |
| E $1-x-y$ | F $1-x-z$ | G $1-y-z$ | H $1-x-y-z$ |