

# Ans. key

## Math 2551 A1-3 Exercise 21

Section:

Name:

Student ID:

Let  $D = \{(x, y, z) : x^2 + y^2 + z^2 \leq 9\}$  and  $R = \{(x, y) : x^2 + y^2 \leq 9\}$ . Mark true or false for each of the following statements.

(1)

True

$$\iiint_D (x^2 + 3) dx dy dz \geq \iiint_D (x^2 + y) dx dy dz.$$

In  $D$ ,  $-3 \leq z \leq 3$ , thus  $x^2 + 3 \geq x^2 + y$

$$\therefore \iiint_D (x^2 + 3) dx dy dz \geq \iiint_D (x^2 + y) dx dy dz$$

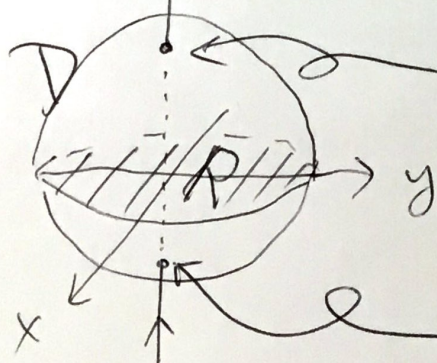
(2)

True

$$\iiint_D dx dy dz = \iint_R \left( \int_{-\sqrt{9-x^2-y^2}}^{\sqrt{9-x^2-y^2}} dz \right) dx dy.$$

The projection of  $D$  onto the  $xy$ -plane is  $R$  (e.g., set  $z=0$ , we have  $x^2 + y^2 \leq 9$ ).

$$x^2 + y^2 + z^2 = 9 \Rightarrow z = \pm \sqrt{9 - x^2 - y^2}$$



$$z = \sqrt{9 - x^2 - y^2}$$

$$z = -\sqrt{9 - x^2 - y^2}$$