

Math 250B
Take-Home Test 4

Deadline: Wed Nov 25, 4:30pm Pacific Time
Submit on D2L or email HowardL@camosun.ca

Number of Questions: 5
Total Marks: 17

Show all your work for full marks.

You MAY use the course website (notes, videos etc)

You may NOT copy from others (classmates, tutors, Chegg etc)

Submit jpg or pdf files

Feel free to handwrite your solutions and take photos of your work

Covers Sections 13.7-13.9, 14.1

1. [5 marks] Use **cylindrical coordinates** to find the volume of the solid region in the **first octant** inside $z = \sqrt{4 - x^2 - y^2}$ and outside $x^2 + y^2 = 2x$.

2. [4 marks] Let Q be the solid region above $z = \sqrt{6x^2 + 6y^2}$, outside $x^2 + y^2 + z^2 = 1$, and inside $x^2 + y^2 + z^2 = 4$.

Use **spherical coordinates** to evaluate $\iiint_Q z \, dV$.

Round your answer to two decimal places.

3. [3 marks] Find the surface area of the portion of the surface $z = y^2 + 8x$ that lies above the triangular region in the xy -plane with vertices $(0, 0)$, $(0, 5)$ and $(5, 5)$.

4. [3 marks] Use a change of variables to evaluate $\iint_R \frac{xy}{1+x^2y^2} \, dydx$,

where R is the region bounded by $xy = 2$, $xy = 7$, $x = 3$ and $x = 5$.

5. [2 marks] Let $\mathbf{F} = [xyz, y, z]$. Find each of the following:

a) the divergence of \mathbf{F}

b) the curl of \mathbf{F}

c) $\nabla \cdot (\nabla \times \mathbf{F})$

d) $\nabla \times (\nabla \times \mathbf{F})$