MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

TEST 2 **MATHEMATICS 3202** JULY 22ND, 2019

Name	**MUN Number**

[6] 1. For each of the following, identify the shape of the corresponding surface. (No justification is required.)

(a) $2x^2 + 3y^2 + z^2 = 1$

(b) $2x^2 + 3y^2 - z^2 = 1$

(c) $2x^2 + 3y^2 - z^2 = 0$

(d) $2x^2 + 3y^2 - z = 0$

(e) $2x^2 - 3y^2 - z = 0$

(f) $2x - 3y - z = 0$

[4] 2. Find an equation of the plane tangent to the surface $x^2 - xy^2 + z^2 = 13$ at the point $P(3, -2)$ which is located above the xy-plane.

[5] 3. Find the directional derivative of $f(x, y) = \cos(2y - x)$ in the direction of $\mathbf{v} = \langle 1,\ 1 \rangle$ at the point $P(0, \frac{\pi}{12})$.

[8] 4. Find the surface area of S, where S consists of the portion of the surface $2x + 6y + 3z = 9$ which lies in the first octant.

[5] 5. Set up, but **do not evaluate**, an iterated integral to represent the surface integral $\iint_S \frac{z}{y}\, dS$ where S is the surface parametrised by $\mathbf{R}(u,v) = \langle 2u,\ v^2,\ 3uv \rangle$ for $0 \le u \le 2$ and $1 \le v \le 4$.

[8] 6. Evaluate $\iiint_E dV$ where E is the solid bounded by the xy-plane and the surfaces $z = x - y$ and $y = x^2$.

[4] 7. Prove that if $z = f(x, y)$ is differentiable and n is a real number then

$$\nabla(z^n) = nz^{n-1}\nabla z.$$

[40]