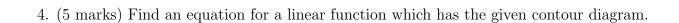# MAC 2313, Section 03 with Dr. Hurdal
Test 1

Name: _____   SSN: _____

Notebooks and textbooks are NOT allowed. Calculators are permitted. This test will be graded out of 55.

1. (4 marks) Find the area of the triangle formed by the points P=(1, 4, 6), Q=(-2,5,-1) and R=(1,-1,1).

2. (6 marks) (a) Find the directional derivative of $f(x,y) = x^3 - 3xy + 2y^2$ at $(1,2)$ in the direction making an angle of of $30°$ with the x-axis.

(b) What is the magnitude of the maximum directional derivative at the given point.

3. (10 marks) Sketch level surfaces of the function $g(x, y, z) = x^2 - y^2 + z^2$.

4. (5 marks) Find an equation for a linear function which has the given contour diagram.

5. (5 marks) Find the tangent plane to the surface $x = y^2 + z^2 - 2$ at the point (4, -1, 1).

6. (10 marks) A wind is blowing SE at 50 km/hr. A plane is flying 60° north of east with an airspeed of 250km/hr. What is the ground speed and direction of the plane?

7. (3 marks) Give a vector that is perpendicular to $\vec{v} = 4\vec{i} + 3\vec{j}$.

8. (6 marks) (a) Compute the differential of $f(x, y) = x\cos(xy) + x^2$.
(6 marks) (b) Then compute the quadratic Taylor polynomial of $f(x, y)$ near (1,0).

Bonus: (6 marks) If $f(x, y, z) = x^4 y + y^2 z^3$ where $x(u, v, w) = uve^w$, $y(u, v, w) = uv^2 e^{-w}$ and $z(u, v, w) = u^2 v \sin(w)$, compute $\dfrac{\partial f}{\partial u}$ when $u = 2$, $v = 1$ and $w = 0$.