MA 3160 R01 **Quiz 2** **Name** _____
Dr. Beverly Baartmans **(Secs 13.3, 13.4, 14.1-14.5)** **please print**

General Directions: Show work so partial credit can be granted. In general, calculators are allowed.

1. Given the vectors: $\vec{u} = \vec{i} + \sqrt{3}\vec{k}$ $\vec{v} = \vec{i} + \sqrt{3}\vec{j}$ $\vec{w} = \sqrt{3}\vec{i} + \vec{j} - \vec{k}$

_____ a. (3 pts) Which pair(s) of the vectors are perpendicular? Defend your answer below with work.

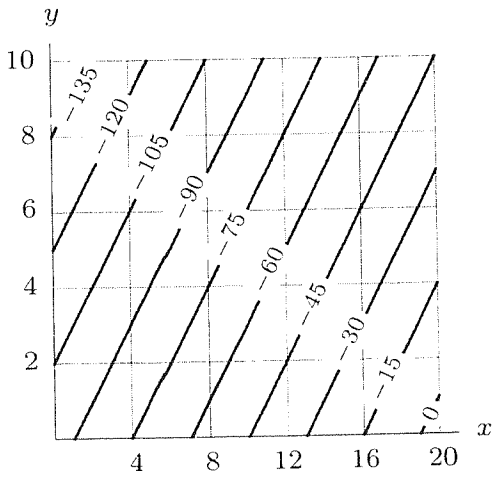
_____ b. (2 pts) Find the angle (in degrees) between $\vec{u}$ and $\vec{v}$.

_____ 2. (2 pts) Use the algebraic definition to find $\vec{v} \times \vec{w}$ where $\vec{v} = 2\vec{i} - 3\vec{j} + \vec{k}$ and $\vec{w} = \vec{i} + 2\vec{j} - \vec{k}$. Calculators may be used for checking only.

3. In the contour diagram for z = f (x, y) ,

_____ a. (2 pts) Is f_x positive or negative?

_____ b. (2 pts) Is f_y positive or negative?



_____ 4. (2pts) Compute the partial derivative z_x for the function

$$z = \sin(5x^3y - 3xy^2) .$$

_____ 5. (4 pts) Find the equation of the tangent plane to the surface $z = x^3 - y^3$ at the point (x, y) = (2, 3).

6. If $f(x, y) = 3x^2y - 4y^2$,

_____ a. (2 pts) find grad f at the point (1, 2).

_____ b. (2 pts) find a vector which is perpendicular to the level curve of f through the point (1,2) in the direction in which f decreases most rapidly.

_____ c. (4 pts) find the directional derivative $f_{\hat{u}}(1, 2)$ for f in the direction of

$$\hat{v} = 3\vec{i} + 2\vec{j} .$$