213 Exam 1

Name: _____ EMPLID: _____

1. (5 points) What is the angle between $\hat{i}$ and $\hat{i} + \sqrt{10}\hat{j}$.

2. (5 points) Find a unit vector that is orthogonal to both $\hat{i} + \hat{j}$ and $\hat{i} + \hat{k}$.

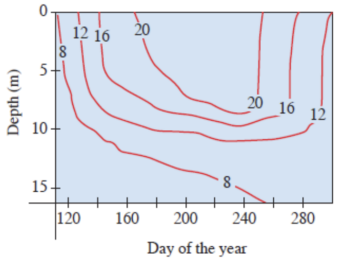
3. (5 points) Find the scalar and vector projections of $\vec{b} = \begin{bmatrix} 4 & 6 \end{bmatrix}$ onto $\vec{a} = \begin{bmatrix} -5 & 12 \end{bmatrix}$.

4. (5 points) Find parametric equations for the line through the points $P(-5, 2, 5)$ and $Q(1, 4, -6)$.

5. (5 points) Find an equation of the plane that passes through the point $(3, 6, -1)$ and contains the line $x = 4 - t, y = 2t - 1, z = -3t$.

6. (5 points) Sketch the graph of $f(x, y) = 16 - x^2 - y^2$.

7. (5 points) Draw a contour map of $f(x, y) = 2x^2 - y^2$.

8. (5 points) Use the contour map 

of the temperature function $T(t, d)$ where T is temperature (in Celcius) t is time (in days) of the year and d is depth of water (in meters) to estimate the temperature at day 220 and depth 5 m.

9. (5 points) Find $\lim_{(x,y)\to(0,0)} \frac{xy^2 \cos y}{6x^2+y^4}$ if the limit exists. Otherwise show that the limit does not exist.

10. (5 points) Find the partial derivatives of $z = \ln(x + t^5)$.

11. (5 points) Find the linear approximation of $f(x, y, z) = \sqrt{x^2 + y^2 + z^2}$ at $(6, 6, 7)$ and use it to approximate $\sqrt{6.1^2 + 5.9^2 + 6.8^2}$.

12. (5 points) Use the table

	y	1.8	2.0	2.2
x				
2.5		12.5	10.2	9.3
3.0		18.1	17.5	15.9
3.5		20.0	22.4	26.1

to approximate $f_x(3, 2)$.

13. (5 points) Use the chain rule to find $\frac{dz}{dt}$ when $z = \sin x \cos y$, $x = \sqrt{t}$, and $y = \frac{9}{t}$. Show your work. Full credit only if you apply the chain rule.