

Math 105 - Multivariable Calculus (Miller) - Midterm #2 - Due March 8, 2013 (start of class)

NAME: _____ Section: _____

BE NEAT PLEASE. QUESTIONS? CALL ME AT 617-835-3982.

INITIAL THE HONOR CODE:: I have neither given nor received aid on this examination. ____

NOTE: The exam is closed book. No calculators, phones, You should be able to do this question in 22 minutes, but you have as long as you wish. Make sure your answer is easy to find – if you write multiple answers I will only look at the first. Box your answers, and if possible answer on this paper.

1. (20 points) Let $\vec{P} = (1, 0, -1)$, $\vec{Q} = (1, 1, 1)$ and $\vec{R} = (1, -2, 1)$.

(a) Find the cosine of the angle between \vec{P} and \vec{Q} , and find the equation of the plane containing \vec{P} , \vec{Q} and \vec{R} .

(b) Compute the following quantities if possible; if not possible, state why not:

◇ (i) $(\vec{P} \times \vec{Q}) \times \vec{R}$;

◇ (ii) $(\vec{P} \times \vec{Q}) \cdot \vec{R}$;

◇ (iii) $(\vec{P} \cdot \vec{Q}) \times \vec{R}$;

◇ (iv) $(\vec{P} \cdot \vec{Q}) + \vec{R}$.

(c) Let $f(x, y, z) = \sin(xyz)$. Find the directional derivative of $f(x, y, z)$ at the point \vec{P} in the direction \vec{Q} .

(d) Let $f(u, v) = u^2 + v^2$, $g(x, y, z) = (\sin(xy) + z, e^x + yz)$ and set $h(x, y, z) = f(g(x, y, z))$. Using the Chain Rule, compute $\frac{\partial h}{\partial x}$ at the point $(0, 0, 0)$.