6. (14 pts.) Find the radian measure of the angle formed by the vectors $\langle 2, 1, 1\rangle$ and $\langle \sqrt{3}, 0, \sqrt{3}\rangle$.

VCU

MATH 307

Multivariate Calculus

R. Hammack

Test 1

February 5, 2014

Name: _____

Score: _____

Directions. Solve the following questions in the space provided. Unless noted otherwise, you must show your work to receive full credit. This is a closed-book, closed-notes test. Calculators, computers, etc., are not used. Put a your final answer in a box, where appropriate.

Good Luck!

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1. (14 pts.) Find the distance between the point $P(0, 0, 1)$ and the line $\mathbf{r}(t) = \langle 1, 5, 2\rangle + t\langle 1, 1, 1\rangle$.

2. (14 pts.) Find the area of the triangle with vertices $A(1,-1,1)$, $B(0,1,1)$, $C(1,0,3)$.

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3. This page concerns the line $x = 2t + 1$, $y = 3t + 2$, $z = 4t + 3$, as well as the line $x = s + 2$, $y = 2s + 4$, $z = -4s - 1$.

(a) (10 pts.) These lines intersect at a point. Find it.

(b) (10 pts.) Note that the vector $\langle -20, 12, 1 \rangle$ is orthogonal to both lines.
Use this information to find an equation of the plane containing the two lines.

(c) (10 pts.) Find the point where the line $\mathbf{r}(t) = \langle t, 2t, 3t \rangle$ intersects the plane from part (b), above.

4. (14 pts.) Find the length of the following curve:
$\mathbf{r}(t) = \langle e^t \cos t,\ e^t,\ e^t \sin t \rangle$, where $-\ln(4) \leqslant t \leqslant 0$.

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5. (14 pts.) Find $\mathbf{r}(t)$ if $\dfrac{d\mathbf{r}}{dt} = \left\langle \dfrac{2}{3}\sqrt{t+1},\ e^{-t},\ \dfrac{1}{t+1} \right\rangle$
and $\mathbf{r}(0) = \langle 0, 0, 1 \rangle$.