MATH 203 QUIZ 3 - Version B

June 9, 2014

Name: ANSWERS

Instructions: (1) No calculators! (2) Use your own scrap paper. Write your answers in the space provided.

1. (1 point each) Complete the statements: (a) $\vec{a}\cdot\vec{b} = 0$ iff $\vec{a}$ and $\vec{b}$ are orthogonal / perpendicular

(b) $\vec{a} \times \vec{b} = \vec{0}$ iff $\vec{a}$ and $\vec{b}$ are parallel

2. (1/2 point each) (a) State the required form for the equation of a line:

(i) Vector form: $\vec{r} = \vec{r}_0 + t\vec{v}$ or $\langle x,y,z\rangle = \langle x_0,y_0,z_0\rangle + t\langle a,b,c\rangle$

(ii) Parametric form: $x = x_0 + at,\ y = y_0 + bt,\ z = z_0 + ct$

(iii) Symmetric form: $\frac{x-x_0}{a} = \frac{y-y_0}{b} = \frac{z-z_0}{c}$

(b) Give the meanings of the symbols used above: $\vec{r} = \langle x,y,z\rangle$ - arbitrary pt, $\vec{r}_0 = \langle x_0,y_0,z_0\rangle$ - point on line, $\vec{v} = \langle a,b,c\rangle$ - direction vector, t parameter

3. (1 point each) (a) Compute $\langle 1,-2,3\rangle \times \langle 0,2,4\rangle =$ $\langle -14,-4,2\rangle$

(b) What's the super special property of your answer to (a), in regards to the vectors involved?
It is orthogonal to both $\langle 1,-2,3\rangle$ and $\langle 0,2,4\rangle$

4. (1/2 point each) Let $\vec{a} = \langle a_1, a_2\rangle$ and $\vec{b} = \langle b_1, b_2\rangle$. What are the formulas for:

(a) $\vec{a}\cdot\vec{b} =$ $a_1b_1 + a_2b_2$

(b) $|\vec{b}| =$ $\sqrt{b_1^2 + b_2^2}$

(c) $3\vec{a} =$ $\langle 3a_1, 3a_2\rangle$

(d) $3\vec{a} - 5\vec{b} =$ $\langle 3a_1 - 5b_1, 3a_2 - 5b_2\rangle$

5. (1 point each) If θ is the angle between $\vec{a}$ and $\vec{b}$, then in terms of θ:

(a) $|\vec{a} \times \vec{b}| =$ $|\vec{a}||\vec{b}|\sin\theta$

(b) $\vec{a}\cdot\vec{b} =$ $|\vec{a}||\vec{b}|\cos\theta$

Bonus 1: (1 point) State the formula for the equation of a plane, and give the meanings of the symbols $a(x-x_0) + b(y-y_0) + c(z-z_0) = 0$; (x_0,y_0,z_0) - point in plane, $\vec{n} = \langle a,b,c\rangle$ is the normal vector.

Bonus 2: (2 points) A big boat is being pulled by two smaller boats. One of the smaller boats is pulling at an angle $\frac{\pi}{3}$ to the horizontal at 3 m/s, the other is pulling at $-\frac{\pi}{6}$ to the horizontal at 2 m/s. In what direction will the big boat move? (Assume you have a bird's eye view of the situation and the tip of the big boat is your "origin") $\left\langle \frac{3}{2} + \sqrt{3},\ \frac{3\sqrt{3}}{2} - 1\right\rangle$