

## Quiz 1-Solutions

MAC 2313

Spring 2006

Full Name: \_\_\_\_\_

Score: \_\_\_\_\_

**Show all of your work for full credit.**

1. Given  $\mathbf{a} = \langle s, 2s, 3s \rangle$  and  $\mathbf{b} = \langle t, -t, 5t \rangle$ , find  $\mathbf{a} \cdot \mathbf{b}$ .

$$\begin{aligned}\mathbf{a} \cdot \mathbf{b} &= st - 2st + 15st \\ &= 14st\end{aligned}$$

2. State whether each expression is meaningful. If not, explain why. If so, state whether it is a vector or scalar

(a)  $\mathbf{a} \cdot (\mathbf{b} \times \mathbf{c})$

Meaningful, scalar quantity

(b)  $\mathbf{a} \times (\mathbf{b} \cdot \mathbf{c})$

Meaningless - you cannot cross a scalar and a vector

3. Find the equation of the plane through the point  $(-2, 8, 10)$  and perpendicular to the line  $x = 1 + t$ ,  $y = 2t$ ,  $z = 4 - 3t$ .

For a plane you need a point and a normal direction. The point is obvious. The direction of the line is orthogonal (i.e. normal) to the plane we are looking for. So a normal direction is  $\langle 1, 2, -3 \rangle$  (coefficients of  $t$  in the parametric equations for the components of the line).

Then the equation of the plane comes from

$$\begin{aligned}0 &= \vec{n} \cdot \vec{r} \\ 0 &= \langle 1, 2, -3 \rangle \cdot \langle x + 2, y - 8, z - 10 \rangle \\ 0 &= (x + 2) + 2(y - 8) - 3(z - 10)\end{aligned}$$