

# Math 220 Class Slides

<http://math.albany.edu/pers/hammond/course/mat220/>

February 14, 2008

## 1 No class Tuesday the 19th

University in Recess

## 2 Assignment due February 21

Expect a **quiz**.

Read Matthews, §§ 8.5 – 8.7

**Exercises:**

Matthews, **186:** 8 – 12

## 3 Exercise No. 1

Where does the line  $L$  through  $A = (3, -2, 7)$  and  $B = (13, 3, -8)$  meet the plane  $z = 0$ ? The general point on  $L$  is

$$\varphi(t) = A + t(B - A) = (1 - t)A + tB = (3 + 10t, -2 + 5t, 7 - 15t)$$

as  $t$  varies in  $\mathbf{R}$ . It crosses the plane  $z = 0$  when  $15t = 7$ , i.e., at the point

$$\varphi(7/15) = \left(\frac{23}{3}, \frac{1}{3}, 0\right) .$$

## 4 Exercise No. 4

$$A = (2, 3, -1) \quad B = (3, 7, 4)$$

Want  $P$  on  $AB$  so that

$$PA/PB = 2/5$$

If  $P = (1-t)A + tB$ , then

$$\frac{PA}{AB} = |t| \quad \frac{PB}{AB} = |1-t| \quad \frac{PA}{PB} = \left| \frac{t}{1-t} \right|$$

Determine  $t$  such that

$$\left| \frac{t}{1-t} \right| = \frac{2}{5} \quad \text{or} \quad \frac{t}{1-t} = \pm \frac{2}{5}$$

Hence,  $t = 2/7$  or  $t = -2/3$ .

$$P_1 = (5/7)(2, 3, -1) + (2/7)(3, 7, 4) = (16/7, 29/7, 3/7)$$

or

$$P_2 = (5/3)(2, 3, -1) - (2/3)(3, 7, 4) = (4/3, 1/3, -13/3)$$

## 5 Exercise No. 5

$$A = (1, 2, 3) \quad B = (-2, 2, 0) \quad C = (4, -1, 7)$$

$\mathcal{M}$  is the line through  $A$  parallel to  $BC$

$$\mathcal{M}: \varphi(t) = (1, 2, 3) + t(6, -3, 7) = (1 + 6t, 2 - 3t, 3 + 7t)$$

$$E = (1, -1, 8) \quad F = (10, -1, 11)$$

$\mathcal{N}$  is the line through  $EF$

$$\mathcal{N}: \psi(u) = (1-u)(1, -1, 8) + u(10, -1, 11) = (1 + 9u, -1, 8 + 3u)$$

The intersection:

$$\varphi(t) = \psi(u)$$

one vector equation = 3 scalar equations in  $t$  and  $u$

## 6 Exercise No. 5: Solving the Equations

$$\begin{cases} 1 + 6t &= 1 + 9u \\ 2 - 3t &= -1 \\ 3 + 7t &= 8 + 3u \end{cases}$$

$$\begin{cases} 6t - 9u &= 0 \\ -3t &= -3 \\ 7t - 3u &= 5 \end{cases}$$

$$t = 1 \quad \text{and} \quad u = \frac{2}{3}$$

Point of intersection:

$$\varphi(1) = \psi(2/3) = (7, -1, 10)$$