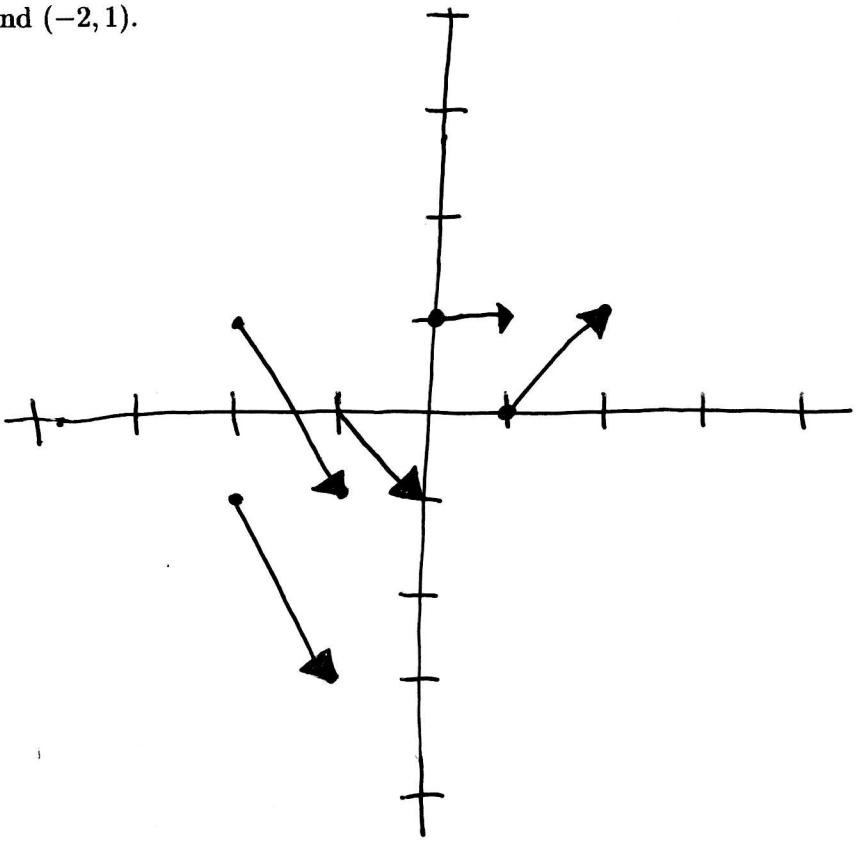
Quiz 7, Math 209, Winter 2007 **Name:** Solutions

Directions: Show ALL of your work to get credit. If you leave something out, then you may be penalized. No calculators. Good luck!

IMPORTANT: This quiz has two sides. Look at both!

1. [10 points] Consider the vector field given by $\mathbf{F}(x, y) = \mathbf{i} + x\mathbf{j}$. Plot the vectors at the points $(1,0)$, $(0,1)$, $(-2,-1)$, $(-1,0)$, and $(-2,1)$.

(x,y)	$F(x,y)$
$(1,0)$	$\langle 1,1 \rangle$
$(0,1)$	$\langle 1,0 \rangle$
$(-2,-1)$	$\langle 1,-2 \rangle$
$(-1,0)$	$\langle 1,-1 \rangle$
$(-2,1)$	$\langle 1,-2 \rangle$



2. [10 points] Find the work done by the force field $\mathbf{F}(x,y,z) = \langle z, x+y, 2 \rangle$ on a particle that moves along the line segment from $(0,1,0)$ to $(1,2,1)$.

Let P be the point $(0,1,0)$ and Q be the point $(1,2,1)$.

$\vec{PQ} = \langle 1-0, 2-1, 1-0 \rangle = \langle 1,1,1 \rangle$

The line segment is given by

$$\vec{r}(t) = \langle 0,1,0 \rangle + t\langle 1,1,1 \rangle = \langle t, 1+t, t \rangle \qquad 0 \le t \le 1$$

or

$$\begin{cases} x = t \\ y = 1+t \\ z = t \end{cases}, \quad 0 \le t \le 1$$

since $\vec{r}\,'(t) = \langle 1,1,1 \rangle$

$$\text{Work} = \int_C \vec{F} \cdot d\vec{r} = \int_0^1 \langle t, 1+2t, 2 \rangle \cdot \langle 1,1,1 \rangle \, dt$$

$$= \int_0^1 (3+3t)\, dt = \left(3t + 3\frac{t^2}{2}\right)\Big|_0^1 =$$

$$= 3 + \frac{3}{2} = \boxed{\frac{9}{2}}$$