Homework #90 **Answers**

From Houghton-Mifflin Precalculus 3rd Edition

3) initial: (-1, -2, 1), terminal: (3, 2, 5)
$v = \langle 3 - -1, 2 - -2, 5 - 1 \rangle = \langle 4, 4, 4 \rangle$
$||v|| = \sqrt{16 + 16 + 16} = \sqrt{48} = 4\sqrt{3}$ $v = 4i + 4j + 4k$

For 7 & 9: $u = \langle -1, 3, 2 \rangle$, $v = \langle 1, -2, -2 \rangle$, $w = \langle 5, 0, -5 \rangle$

7) $z = u - 2v$: $2v = \langle 2, -4, -4 \rangle$
$z = \langle -1 - 2, 3 - -4, 2 - -4 \rangle = \langle -3, 1, 6 \rangle$

9) $2z - 4u = w$ $2z = w + 4u$ $z = 1/2(w + 4u)$
$4u = \langle -4, 12, 8 \rangle$
$w + 4u = \langle 5 + -4, 0 + 12, -5 + 8 \rangle = \langle 1, 12, 3 \rangle$ $z = \langle 1/2, 6, 3/2 \rangle$

11) $v = \langle 4, 1, 4 \rangle$ $||v|| = \sqrt{16 + 1 + 16} = \sqrt{33}$

13) $v = 4i + 3j - 7k$ $||v|| = \sqrt{16 + 9 + 49} = \sqrt{74}$

17) $u = 8i + 3j - k$
a) same direction: $16i + 6j - 2k$ or other possibilities
b) opposite direction: $-16i - 6j + 2k$ or other possibilities

25) $u = \langle 4, 4, -1 \rangle$, $v = \langle 2, -5, -8 \rangle$
$u \cdot v = (4)(2) + (4)(-5) + (-1)(-8) = 8 + -20 + 8 = -4$

29) $u = \langle 0, 2, 2 \rangle$, $v = \langle 3, 0, -4 \rangle$

$$\cos\theta = \frac{(0)(3) + (2)(0) + (2)(-4)}{(\sqrt{0 + 4 + 4})(\sqrt{9 + 0 + 16})} = \frac{0 + 0 + -8}{(\sqrt{8})(\sqrt{25})} = \frac{-8}{\sqrt{200}} = -.5657$$

$\theta = 124.45°$

31) $u = 10i + 40j$, $v = -3j + 8k$

$$\cos\theta = \frac{(10)(0) + (40)(-3) + (0)(8)}{(\sqrt{100 + 800 + 0})(\sqrt{0 + 9 + 64})} = \frac{0 + -120 + 0}{(\sqrt{900})(\sqrt{73})} = \frac{-120}{30\sqrt{73}} = -.4682$$

$\theta = 117.9°$

39) $A(1, 3, 2)$, $B(-1, 2, 5)$, $C(3, 4, -1)$
$AB: \langle -1 - 1, 2 - 3, 5 - 2 \rangle = \langle -2, -1, 3 \rangle$
$BC: \langle 3 - -1, 4 - 2, -1 - 5 \rangle = \langle 4, 2, -6 \rangle$
Since the component form of BC is a scalar multiple (by -2) of AB they are parallel and since they share a point they are collinear.