Solution to Practice 3t

B1(a)

$\langle \vec{u}, \vec{v} \rangle = u_1\overline{v}_1 + u_2\overline{v}_2 = (-2-3i)(4+i) + (2+i)(4-i)$
$= -8 - 2i - 12i - 3i^2 + 8 - 2i + 4i - i^2$
$= 4 - 12i$

$\langle \vec{v}, \vec{u} \rangle = v_1\overline{u}_1 + v_2\overline{u}_2 = (4-i)(-2+3i) + (4+i)(2-i)$
$= -8 + 12i + 2i - 3i^2 + 8 - 4i + 2i - i^2$
$= 4 + 12i$

$||\vec{u}|| = \sqrt{(-2)^2 + (-3)^2 + 2^2 + 1^2} = \sqrt{18} = 3\sqrt{2}$

$||\vec{v}|| = \sqrt{4^2 + (-1)^2 + 4^2 + 1^2} = \sqrt{34}$

B1(b)

$\langle \vec{u}, \vec{v} \rangle = u_1\overline{v}_1 + u_2\overline{v}_2 = (3-i)(1-i) + (1+2i)(2-i)$
$= 3 - 3i - i + i^2 + 2 - i_4 i - 2i^2$
$= 6 - i$

$\langle \vec{v}, \vec{u} \rangle = v_1\overline{u}_1 + v_2\overline{u}_2 = (1+i)(3+i) + (2+i)(1-2i)$
$= 3 + i + 3i + i^2 + 2 - 4i + i - 2i^2$
$= 6 + i$

$||\vec{u}|| = \sqrt{3^2 + (-1)^2 + 1^2 + 2^2} = \sqrt{15}$

$||\vec{v}|| = \sqrt{1^2 + 1^2 + 2^2 + 1^2} = \sqrt{7}$

B1(c)

$\langle \vec{u}, \vec{v} \rangle = u_1\overline{v}_1 + u_2\overline{v}_2 = (4-3i)(3) + (2-i)(2i)$
$= 12 - 9i + 4i - 2i^2$
$= 14 - 5i$

$\langle \vec{v}, \vec{u} \rangle = v_1\overline{u}_1 + v_2\overline{u}_2 = (3)(4+3i) + (-2i)(2+i)$
$= 12 + 9i - 4i - 2i^2$
$= 14 + 5i$

$||\vec{u}|| = \sqrt{4^2 + (-3)^2 + 2^2 + (-1)^2} = \sqrt{30} =$

$||\vec{v}|| = \sqrt{3^2 + (-2)^2} = \sqrt{13}$

B1(d)

$\langle \vec{u}, \vec{v} \rangle = u_1\overline{v}_1 + u_2\overline{v}_2 = (1+i)(0) + (-1+i)(0)$
$= 0$

$\langle \vec{v}, \vec{u} \rangle = v_1 \overline{u}_1 + v_2 \overline{u}_2 = (0)(1-i) + (0)(-1-i)$
$= 0$

$||\vec{u}|| = \sqrt{1^1 + 1^1 + (-1)^2 + 1^2} = \sqrt{4} = 2$

$||\vec{v}|| = \sqrt{0^2 + 0^2} = 0$