

Homework #91

Answers

From Houghton-Mifflin Precalculus

3rd Edition

p789:

5) $u = \langle 1, -4, 0 \rangle$, $v = \langle 2, 6, 0 \rangle$

$$u \times v = \begin{vmatrix} i & j & k \\ 1 & -4 & 0 \\ 2 & 6 & 0 \end{vmatrix} = (0 - 0)i - (0 - 0)j + (6 + 8)k \\ = 0i - 0j + 14k = \langle 0, 0, 14 \rangle$$

orthogonal?

for u: $u \cdot (u \times v) = (1)(0) + (-4)(0) + (0)(14) = 0$

for v: $v \cdot (u \times v) = (2)(0) + (6)(0) + (0)(14) = 0$

6) $u = \langle -3, 2, 3 \rangle$, $v = \langle 0, 1, 0 \rangle$

$$u \times v = \begin{vmatrix} i & j & k \\ -3 & 2 & 3 \\ 0 & 1 & 0 \end{vmatrix} = (0 - 3)i - (0 - 0)j + (-3 - 0)k \\ = -3i - 0j - 3k = \langle -3, 0, -3 \rangle$$

orthogonal?

for u: $u \cdot (u \times v) = (-3)(-3) + (2)(0) + (3)(-3) = 0$

for v: $v \cdot (u \times v) = (0)(-3) + (1)(0) + (0)(-3) = 0$

7) $u = \langle 7, -5, 2 \rangle$, $v = \langle -1, 4, -1 \rangle$

$$u \times v = \begin{vmatrix} i & j & k \\ 7 & -5 & 2 \\ -1 & 4 & -1 \end{vmatrix} = (5 - 8)i - (-7 - -2)j + (28 - 5)k \\ = -3i + 5j + 23k = \langle -3, 5, 23 \rangle$$

orthogonal?

for u: $u \cdot (u \times v) = (7)(-3) + (-5)(5) + (2)(23) = -21 + -25 + 46 = 0$

for v: $v \cdot (u \times v) = (-3)(-1) + (5)(4) + (23)(-1) = 3 + 20 + -23 = 0$

8) $u = \langle -5, 5, 11 \rangle$, $v = \langle 2, 2, 3 \rangle$

$$u \times v = \begin{vmatrix} i & j & k \\ -5 & 5 & 11 \\ 2 & 2 & 3 \end{vmatrix} = (15 - 22)i - (-15 - 22)j + (-10 - 10)k \\ = -7i + 37j - 20k = \langle -7, 37, -20 \rangle$$

orthogonal?

for u: $u \cdot (u \times v) = (-5)(-7) + (5)(37) + (11)(-20) = 35 + 185 + -220 = 0$

for v: $v \cdot (u \times v) = (2)(-7) + (2)(37) + (3)(-20) = -14 + 74 + -60 = 0$

9) $u = 6i + 2j + k$, $v = i + 3j - 2k$

$$u \times v = \begin{vmatrix} i & j & k \\ 6 & 2 & 1 \\ 1 & 3 & -2 \end{vmatrix} = (-4 - 3)i - (-12 - 1)j + (18 - 2)k \\ = -7i + 13j + 16k$$

orthogonal?

for u: $u \cdot (u \times v) = (6)(-7) + (2)(13) + (1)(16) = -42 + 26 + 16 = 0$

for v: $v \cdot (u \times v) = (1)(-7) + (3)(13) + (-2)(16) = -7 + 39 + -32 = 0$