Homework #86   **Answers**

From Houghton-Mifflin Precalculus   **3ʳᵈ Edition**

p464:

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

$\cos \theta = \dfrac{(-1)(0) + (0)(2)}{(\sqrt{1 + 0})(\sqrt{0 + 2})}$ $\cos \theta = \dfrac{0}{\sqrt{2}} = 0$ $\theta = 90°$

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

$\cos \theta = \dfrac{(4)(-2) + (4)(0)}{(\sqrt{16 + 16})(\sqrt{4 + 0})}$ $\cos \theta = \dfrac{-8 + 0}{(\sqrt{32})(\sqrt{4})} = \dfrac{-8}{\sqrt{128}}$ $\cos \theta = \dfrac{-8}{8\sqrt{2}} = \dfrac{-1}{\sqrt{2}}$ $\theta = 135°$

19) $u = 3i + 4j$, $v = -2i + 3j$

$\cos \theta = \dfrac{(3)(-2) + (4)(3)}{(\sqrt{9 + 16})(\sqrt{4 + 9})}$ $\cos \theta = \dfrac{-6 + 12}{(\sqrt{25})(\sqrt{13})} = \dfrac{6}{5\sqrt{13}}$ $\cos \theta = .3328$

$\theta = 70.6°$

20) $u = 2i - 3j$, $v = i - 2j$

$\cos \theta = \dfrac{(2)(1) + (-3)(-2)}{(\sqrt{4 + 9})(\sqrt{1 + 4})}$ $\cos \theta = \dfrac{2 + 6}{(\sqrt{13})(\sqrt{5})} = \dfrac{8}{\sqrt{65}}$ $\cos \theta = .9923$

$\theta = 7.1°$

21) $u = 2i$, $v = -3j$

$\cos \theta = \dfrac{(2)(0) + (0)(-3)}{(\sqrt{4 + 0})(\sqrt{0 + 9})}$ $\cos \theta = \dfrac{0 + 0}{(2)(3)} = \dfrac{0}{6}$ $\cos \theta = 0$

$\theta = 90°$

22) $u = 4j$, $v = -3i$

$\cos \theta = \dfrac{(0)(-3) + (4)(0)}{(\sqrt{0 + 16})(\sqrt{9 + 0})}$ $\cos \theta = \dfrac{0 + 0}{(4)(3)} = \dfrac{0}{12}$ $\cos \theta = 0$

$\theta = 90°$

31) $\|u\| = 4$, $\|v\| = 10$, $\theta = 2\pi/3$

$\cos 120 = \dfrac{u \cdot v}{(4)(10)}$ $-\tfrac{1}{2} = \dfrac{u \cdot v}{40}$ $-20 = u \cdot v$

32) $\|u\| = 100$, $\|v\| = 250$, $\theta = \pi/6$

$\cos 30 = \dfrac{u \cdot v}{(100)(250)}$ $\sqrt{3}/2 = \dfrac{u \cdot v}{25000}$ $12500\sqrt{3} = u \cdot v$

33) $u = \langle -12, 30 \rangle$, $v = \langle 1/2, -5/4 \rangle$

$\cos \theta = \dfrac{(-12)(\tfrac{1}{2}) + (30)(-5/4)}{(\sqrt{144 + 900})(\sqrt{\tfrac{1}{4} + 25/16})}$ $\cos \theta = \dfrac{-6 + -150/4}{(\sqrt{1044})(\sqrt{29/16})}$

$\cos \theta = \dfrac{-174/4}{\sqrt{30276}/4} = \dfrac{-174}{\sqrt{30276}}$ $\cos \theta = \dfrac{-174}{174} = -1$ $\theta = 180°$ **Parallel**

34) $u = \langle 15, 45 \rangle$, $v = \langle -5, 12 \rangle$

$\cos \theta = \dfrac{(15)(-5) + (45)(12)}{(\sqrt{225 + 2025})(\sqrt{25 + 144})}$ $\cos \theta = \dfrac{-75 + 540}{(\sqrt{2250})(\sqrt{169})}$ $\cos \theta = \dfrac{465}{(15\sqrt{10})(13)}$

$= \dfrac{465}{195\sqrt{10}}$ $\cos \theta = .7541$

$\theta = 41.1°$ **Neither**