

HW 12.3 #1, 13, 21, 29, 31, 57, 63

che 9120

✓1.) $\langle 1, 2, 1 \rangle \cdot \langle 4, 3, 5 \rangle = 4 + 6 + 5 = 15$

✓13.) $\cos \theta = \frac{\langle 1, 1, 1 \rangle \cdot \langle 1, -2, -2 \rangle}{|\langle 1, 1, 1 \rangle| \cdot |\langle 1, -2, -2 \rangle|} = \frac{1 - 2 - 2}{\sqrt{3} \cdot \sqrt{9}} = \frac{-3}{3\sqrt{3}} = -\frac{1}{\sqrt{3}}$

$\theta = \cos^{-1}\left(-\frac{1}{\sqrt{3}}\right) \approx 2.1863 \approx 125.26^\circ$

The vectors are not orthogonal, the angle between them is 125.26° which is obtuse.

✓21.) $\cos \theta = \frac{\langle 1, 1, 0 \rangle \cdot \langle 0, 1, 2 \rangle}{|\langle 1, 1, 0 \rangle| \cdot |\langle 0, 1, 2 \rangle|} = \frac{0 + 1 + 0}{\sqrt{2} \cdot \sqrt{5}} = \frac{1}{\sqrt{10}}$

$\theta = \cos^{-1}\left(\frac{1}{\sqrt{10}}\right) \approx 1.2490 \approx 71.5651^\circ$

✓29.) a. $\langle b, 3, 2 \rangle, \langle 1, b, 1 \rangle$

$\frac{\langle b, 3, 2 \rangle \cdot \langle 1, b, 1 \rangle}{|\langle b, 3, 2 \rangle| \cdot |\langle 1, b, 1 \rangle|} = 0 \rightarrow \frac{b + 3b + 2}{\sqrt{b^2 + 14} \cdot \sqrt{b^2 + 2}} = \frac{4b + 2}{\sqrt{b^2 + 16b^2 + 28}}$

$4b + 2 = 0 \rightarrow \frac{4b}{4} = -\frac{2}{4} \rightarrow b = -\frac{1}{2}$

b. $\langle 4, -2, 7 \rangle, \langle b^2, b, 0 \rangle$

$\frac{\langle 4, -2, 7 \rangle \cdot \langle b^2, b, 0 \rangle}{|\langle 4, -2, 7 \rangle| \cdot |\langle b^2, b, 0 \rangle|} = 0 \rightarrow \langle 4, -2, 7 \rangle \cdot \langle b^2, b, 0 \rangle = 0$

$4b^2 - 2b + 0 = 0$

$2b(2b - 1) = 0 \rightarrow 2b = 0 \rightarrow b = 0$

$2b - 1 = 0 \rightarrow b = \frac{1}{2}$

Correcting!

St. proj $\frac{\langle 5, 7, -4 \rangle \cdot \langle 0, 0, 1 \rangle}{|\langle 0, 0, 1 \rangle| \cdot |\langle 0, 0, 1 \rangle|}$

$= -4 \cdot \langle 0, 0, 1 \rangle = \langle 0, 0, -4 \rangle$

63. $\frac{\langle 3, 5 \rangle \cdot \langle 8, 2 \rangle}{|\langle 8, 2 \rangle| \cdot \frac{\sqrt{68}}{\sqrt{68}}} = \frac{34 \cdot \frac{\sqrt{68}}{\sqrt{68}}}{\frac{\sqrt{68}}{2} \cdot \frac{\sqrt{4} \cdot \sqrt{17}}{2}} = \frac{34 \sqrt{34}}{24} = \sqrt{34}$

✓31.) $\langle 2, 0, -3 \rangle \cdot \langle x, y, z \rangle = 0$

$2x + 0y - 3z = 0$

$\langle 3, 4, 2 \rangle$

$\langle 12, 23, 8 \rangle$

✓57.) $u = 5i + 7j - 4k = \langle 5, 7, -4 \rangle, v = k = \langle 0, 0, 1 \rangle$

proj $_u v = \frac{\langle 5, 7, -4 \rangle \cdot \langle 0, 0, 1 \rangle}{|\langle 5, 7, -4 \rangle|} \cdot \frac{\langle 5, 7, -4 \rangle}{|\langle 5, 7, -4 \rangle|} = \frac{-4}{90} \cdot \langle 5, 7, -4 \rangle$

$= \left\langle -\frac{20}{90}, -\frac{28}{90}, \frac{16}{90} \right\rangle$

✓63.) comp $_u v = \frac{\langle 3, 5 \rangle \cdot \langle 8, 2 \rangle}{|\langle 3, 5 \rangle| \cdot \frac{\sqrt{34}}{\sqrt{34}}} = \frac{34 \cdot \frac{\sqrt{34}}{\sqrt{34}}}{24} = \sqrt{34}$