Casio fx-82ms

Vectors Quiz 2 Version 1 Thursday, May 23, 2024 Name: [redacted] /13

1. Solve for k if we know that $\vec{a} = \overrightarrow{(3,-8,2)}, \vec{b} = \overrightarrow{(-4,7,1)}$ and $\vec{c} = \overrightarrow{(29,-70,k)}$ are coplanar /4

$(29,-70,k) = x(3,-8,2) + y(-4,7,1)$

$3x - 4y = 29$

$-8x + 7y = -70$

$2x + y = k$

$3x = 4y + 29$

$x = \frac{4y+29}{3}$

$-11y = 22$

$y = -2$

$3x + 4(-2) = 29$

$3x + 8 = 29$

$x = 7$

$2x + y = k$

$2(7) - 2 = k$

$14 - 2 = k$

$k = 12$

$-8\left(\frac{4y+29}{3}\right) + 7y = -70$

$\frac{-32y - 232}{3} + 7y = -70$

$-32y - 232 + 21y = -210$

4

$k = 12$

2. Give possible values for m and n such that the vectors $\vec{u} = \overrightarrow{(3,m,5)}$ and $\vec{v} = \overrightarrow{(-2,4,n)}$ are perpendicular. There are many different possible answers here. (No decimal approximations). /3

$(3,m,5) \cdot (-2,4,n) = 0$

$-6 + 4m + 5n = 0$

$5n = -4m + 6$

$n = \frac{-4m+6}{5}$

$n = \frac{-2(2m-3)}{5}$

$m = \frac{-5n+6}{4}$

n	m
0	3/2
1	1/4

3

A possible pair of values making the vectors perpendicular are $m =$ 3/2 and $n =$ 0

(There are many different possible answers; do not use decimal approximations.)

7

$a \cdot b = |\vec{a}||\vec{b}|\cos\theta$

/13

3. Determine the measure of the angle between the vectors $\vec{c} = \overrightarrow{(-4,1,2)}$ and $\vec{d} = \overrightarrow{(1,5,-2)}$. Round your answer to the nearest tenth of a degree (i.e., one decimal place) if necessary. /3

$(-4,1,2)\cdot(1,5,-2) = \left(\sqrt{4^2+1^2+2^2}\right)\left(\sqrt{1^2+5^2+(-2)^2}\right)\cos\theta$

$-4+5-4 = (\sqrt{21})(\sqrt{30})\cos\theta$

$\frac{-3}{(\sqrt{21})(\sqrt{30})} = \cos\theta$

3

$\theta = 96.86°$

$-3/25.0998$

$\theta = 96.9°$

Round your answer to one tenth of a degree if necessary (i.e., one decimal place).

4. The vectors $\vec{a}, \vec{b}$ and $\vec{c}$ are mutually perpendicular (i.e., each of the vectors is perpendicular with each of the other vectors). If we know that $|\vec{a}| = 6$, $|\vec{b}| = 11$ and $|\vec{c}| = 4$, evaluate $(\vec{a} - \vec{c}) \cdot (\vec{c} + \vec{b} - \vec{a})$

/3

$(\vec{a}-\vec{c})\cdot(\vec{c}+\vec{b}-\vec{a})$

$= (\vec{a}\cdot\vec{c}) + (\vec{a}\cdot\vec{b}) - |\vec{a}|^2 - |\vec{c}|^2 - (\vec{c}\cdot\vec{b}) - (\vec{c}\cdot\vec{a})$

$= -(6)^2 - (4)^2$

$= -36 - 16$

$= -52$

$|A||B|\cos\theta$

2

$(\vec{a} - \vec{c}) \cdot (\vec{c} + \vec{b} - \vec{a}) = -52$