

Answer on Question #47027 – Math – Vector Calculus

Find the dot product of the following vectors.

$r_1 = 2i + 3j - 5k$, $r_2 = i - 2j + 4k$. Find $r_1 \cdot r_2$.

-24

20

34

23

Solution:

Points in this 3-dimensional space must therefore have three coordinates, not two, and are written as ordered triples: (x, y, z) . Similarly, vectors will now have three components, such that vector r_1 will have components r_{1x}, r_{1y} and r_{1z} . Writing in ijk notation, we then have k , the unit vector pointing along the z -direction. Three-dimensional vectors can also be written with magnitudes and directions. We can now state the definition of the dot product in 3D form:

$$r_1 \cdot r_2 = r_{1x}r_{2x} + r_{1y}r_{2y} + r_{1z}r_{2z}$$

Now we can determine the dot product of the given vectors. We apply the formula noted above.

The dot product of $r_1 \cdot r_2$ equals

$$r_1 \cdot r_2 = 2 \cdot 1 + 3 \cdot (-2) + (-5) \cdot 4 = 2 + (-6) + (-20) = -4 - 20 = -24$$

Answer: The dot product of the following vectors r_1 and r_2 is equal to -24.