

No calculators will be allowed and no partial credit will be given.

---

1. Find the dot product of  $\vec{r} = \langle 2, -1 \rangle$  and  $\vec{s} = \langle 3, 1 \rangle$  .
2. Find the dot product of  $\vec{u} = \langle 3, -1, -2 \rangle$  and  $\vec{v} = \langle 2, 5, 1 \rangle$  .
3. Find the cosine of the angle between vectors  $\vec{r} = \langle -1, 3 \rangle$  and  $\vec{s} = \langle 4, 1 \rangle$  .
4. Find the cosine of the angle between vectors  $\vec{r} = \langle 2, -1, 3 \rangle$  and  $\vec{s} = \langle 1, 5, -2 \rangle$  .
5. Determine if the vectors  $\vec{u} = \langle 1, 2, -3 \rangle$  and  $\vec{v} = \langle 1, 2, -1 \rangle$  are orthogonal, parallel, or neither.
6. Find the vector projection of  $\vec{a} = \langle 3, -2 \rangle$  onto  $\vec{b} = \langle 3, 1 \rangle$  .
7. Find the vector projection of  $\vec{a} = \langle 2, -1, -2 \rangle$  onto  $\vec{b} = \langle 2, 4, -2 \rangle$  .

1. 5

2. -1

3.  $-\frac{1}{\sqrt{10}\sqrt{17}}$

4.  $-\frac{9}{\sqrt{14}\sqrt{30}}$

5. *Neither*

6.  $\langle \frac{21}{10}, \frac{7}{10} \rangle$

7.  $\langle \frac{1}{3}, \frac{2}{3}, -\frac{1}{3} \rangle$