

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

1. Find the dot product of $\vec{r} = \langle 3, -1 \rangle$ and $\vec{s} = \langle 0, 1 \rangle$.
2. Find the dot product of $\vec{u} = \langle 3, -2, 3 \rangle$ and $\vec{v} = \langle 3, 2, -3 \rangle$.
3. Find the cosine of the angle between vectors $\vec{r} = \langle 3, -2 \rangle$ and $\vec{s} = \langle 1, -3 \rangle$.
4. Find the cosine of the angle between vectors $\vec{r} = \langle 1, -1, 3 \rangle$ and $\vec{s} = \langle 0, 2, -2 \rangle$.
5. Determine if the vectors $\vec{u} = \langle 1, 2, -3 \rangle$ and $\vec{v} = \langle 3, -3, -1 \rangle$ are orthogonal, parallel, or neither.
6. Find the vector projection of $\vec{a} = \langle 3, 5 \rangle$ onto $\vec{b} = \langle 2, -3 \rangle$.
7. Find the vector projection of $\vec{a} = \langle -1, -2, 3 \rangle$ onto $\vec{b} = \langle 3, 1, -2 \rangle$.

1. -1

2. -4

3. $\frac{9}{\sqrt{10}\sqrt{13}}$

4. $-\frac{4}{\sqrt{2}\sqrt{11}}$

5. *Orthogonal*

6. $\langle -\frac{18}{13}, \frac{27}{13} \rangle$

7. $\langle -\frac{33}{14}, -\frac{11}{14}, \frac{11}{7} \rangle$