

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

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1. Find the dot product of  $\vec{r} = \langle 3, -1 \rangle$  and  $\vec{s} = \langle 0, 4 \rangle$  .
2. Find the dot product of  $\vec{u} = \langle 2, -1, 5 \rangle$  and  $\vec{v} = \langle 3, 2, 1 \rangle$  .
3. Find the cosine of the angle between vectors  $\vec{r} = \langle -1, 3 \rangle$  and  $\vec{s} = \langle 1, 1 \rangle$  .
4. Find the cosine of the angle between vectors  $\vec{r} = \langle -3, -1, -2 \rangle$  and  $\vec{s} = \langle 2, -2, 3 \rangle$  .
5. Determine if the vectors  $\vec{u} = \langle 1, 2, -3 \rangle$  and  $\vec{v} = \langle 6, 3, 12 \rangle$  are orthogonal, parallel, or neither.
6. Find the vector projection of  $\vec{a} = \langle 3, -1 \rangle$  onto  $\vec{b} = \langle 2, 1 \rangle$  .
7. Find the vector projection of  $\vec{a} = \langle -1, -2, 3 \rangle$  onto  $\vec{b} = \langle 2, -3, 2 \rangle$  .

1.  $-4$

2.  $9$

3.  $\frac{2}{\sqrt{2}\sqrt{10}}$

4.  $-\frac{10}{\sqrt{14}\sqrt{17}}$

5. *Neither*

6.  $\langle 2, 1 \rangle$

7.  $\langle \frac{20}{17}, -\frac{30}{17}, \frac{20}{17} \rangle$