Name: Solution

1. Let $\vec{u} = (3,3,3)$ and $\vec{v} = (1,0,4)$. Find the (Euclidean) distance between $\vec{u}$ and $\vec{v}$, and find the cosine of the angle between $\vec{u}$ and $\vec{v}$. State whether the angle is acute, obtuse, or 90°.

$$\|\vec{u} - \vec{v}\| = \|(3,3,3) - (1,0,4)\|$$

$$= \|(2,3,-1)\|$$

$$= \sqrt{2^2 + 3^2 + (-1)^2}$$

$$= \underline{\sqrt{14}}.$$

$$\cos\theta = \frac{\vec{u}\cdot\vec{v}}{\|\vec{u}\|\,\|\vec{v}\|}$$

$$= \frac{15}{3\sqrt{3}\sqrt{17}}$$

$$= \underline{\frac{5}{\sqrt{21}}}.$$

$$\vec{u}\cdot\vec{v} = (3,3,3)\cdot(1,0,4) = 15$$

$$\|\vec{u}\| = \sqrt{3^2+3^2+3^2} = 3\sqrt{3}$$

$$\|\vec{v}\| = \sqrt{1^2+0^2+4^2} = \sqrt{17}$$

$\cos\theta > 0$, so θ is <u>acute</u>.

(<u>or</u>: $\vec{u}\cdot\vec{v} > 0$, so θ is <u>acute</u>.)