1. $2(a + b + c)$ and $4abc$

2. (a) Yes
   (b) $A$ has 0 on the diagonal and 1 everywhere else; $I$ is the other way around. So their sum has 1s everywhere.
   (c) $n - 1$ once and $-1$ $n - 1$ times.

4. (a) If $u + v$ and $u - v$ are orthogonal, then by Pythagoras, $||u + v||^2 + ||u - v||^2 = ||2u||^2$ and $||u + v||^2 + ||v - u||^2 = ||2v||^2$. Since the left-hand-sides are equal, the right-hand-sides are equal. Thus $||u|| = ||v||$.
   (b) If $||u|| = ||v||$, then $\langle u + v, u - v \rangle = ||u||^2 + \langle v, u \rangle - \langle u, v \rangle - ||v||^2 = \langle v, u \rangle - \langle u, v \rangle = 0$, where the latter uses the fact we are in a real space.
   (c) Consider the complex vector space $\mathbb{C}$ with the standard dot product. Let $u = 1 + 2i$ and $v = 2 + i$. Then $||u|| = ||v||$, but $\langle u + v, u - v \rangle = (3 + 3i)(i - 1) = -6i$.

5. Multiple answers including $(\frac{1}{3}, -\frac{2}{3}, \frac{2}{3})$, $\frac{1}{\sqrt{2}}(0, 1, 1)$ and $(-\frac{2}{9}, -\frac{1}{18}, \frac{1}{18})$.

6. (a) the identity
   (b) nonsingular/invertible