Let $u = (1, 1), v = (-3/2, 2)$. Find and plot:

1. $u + v$
2. $2u - v$
3. $u/|u|$
4. $1/3 u + 2/3 v$
5. $-v/|v|$
6. A unit vector perpendicular to $v$

Write at least 3 tips for plotting points in polar coordinates. Use your tips to plot the curve $r = \sin \theta + \cos^2 \theta$.

Set up the integral that would give you the length of this curve for $0 \leq \theta \leq 2\pi$. Draw a picture to help you remember the arc length formula for polar coordinates.
Let \( u = (1, 1), v = (-3, 1), w = (-1, 3) \). Find numbers \( \alpha, \beta \) such that \( w = \alpha u + \beta v \) and plot your result.

A 300lb football player running east tackles a 200lb football player running south. If the second player was running twice as fast as the first player and they fall in the same direction post-tackle, what vector describes that direction? (Physics fact: the total momentum of the players, equal to mass times velocity, is conserved.)

There are two objects: one of mass \( M \) at location \( A \) and one of mass \( m \) at location \( B \). Where is the center of mass of the system? (Imagine the center of mass as the fulcrum of a scale balancing the two objects.)

True or False?

1. The polar curves \( r = 1 - \sin 2\theta, r = \sin 2\theta - 1 \) have the same graph.
2. If \( x = f(t) \) and \( y = g(t) \) are twice differentiable, then \( \frac{d^2y}{dx^2} = \frac{d^2y/dt^2}{d^2x/dt^2} \).
3. The distance traveled by an object is equal to the integral of its velocity over time.
4. For any vectors \( u \) and \( v \) in \( \mathbb{R}^n \), \( u + v = v + u \).
5. For any vectors \( u \) and \( v \) in \( \mathbb{R}^n \), \( |u + v| = |u| + |v| \).
6. The set of points \( \{x, y, z| x^2 + y^2 = 1 \} \) is a circle.