10.2, 12.2: Recap

Monday, February 1

♣

Let $u = \langle 1, 1\rangle, v = \langle -3/2, 2\rangle$. Find and plot:

1. $u + v$
2. $2u - v$
3. $u/|u|$
4. $\frac{1}{3}u + \frac{2}{3}v$
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 $u = \langle 1, 1\rangle, v = \langle -3, 1\rangle, w = \langle -1, 3\rangle$. Find numbers α, β 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 $\frac{d^2y}{dx^2} = \frac{d^2y/dt^2}{d^2x/dx^2}$.
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.