

Math 142-2, Group work 3

Problem 1

For each of the following, assume that $\mathbf{u}(t)$ and $\mathbf{v}(t)$ are vector valued functions of t . Assume $f(t)$ is a scalar function of t . The vectors \mathbf{r} and \mathbf{s} as well as the scalars a and b are constants. Simplify each expression below:

(a) $\frac{d}{dt}(\mathbf{u} \cdot \mathbf{v})$

(b) $\frac{d}{dt}(f(\|\mathbf{u}\|^2))$

(c) $\frac{d}{dt}(\|\mathbf{u}\|)$

(d) $\frac{d}{dt}\left(\frac{\mathbf{u} \cdot \mathbf{r}}{\mathbf{u} \cdot \mathbf{s}}\right)$

(e) $\frac{d^2}{dt^2}((\mathbf{u} \cdot \mathbf{r})\mathbf{v})$

(f) $\int \mathbf{u} \cdot \dot{\mathbf{u}} dt$

Problem 2

Find the general solution to each system of ODE's:

(a) $x' = y, y' = -x$

(b) $x' = y + 2x, y' = -z, z' = -3x - 3y + z$