Math 5B - HW4 (Written Portion)

Due Aug 31

You must show your work to receive credit.

4.5.2 Show that the curve $\mathbf{c}(t) = (\frac{3}{5}\cos t + \frac{4}{5}\sin t, -\frac{3}{5}\sin t + \frac{4}{5}\cos t)$ is a flow line of the vector field $\mathbf{F}(x,y) = (\frac{y}{\sqrt{x^2+y^2}}, -\frac{x}{\sqrt{x^2+y^2}})$ going through the point $(\frac{4}{5}, -\frac{3}{5})$.

4.5.5 Find the flow line of the constant vector field $\mathbf{F}(x,y) = (a,b)$ (a and b are real numbers with $a \neq 0$ and/or $b \neq 0$) that goes through the origin.

4.5.12 Show that the curve $\mathbf{c}(t) = (e^t, 2\ln t, t^{-1})$, $t > 0$ is a flow line of the vector field $\mathbf{F}(x,y,z) = (x, 2z, -z^2)$.

4.6.13 Find the curl and divergence of the vector field $\mathbf{F}(x,y,z) = (y^2 z, -xz, xyz)$.

4.6.14 Find the curl and divergence of the vector field $\mathbf{F}(x,y,z) = (0, 0, \ln z + xy)$.

4.6.25 Consider $\mathbf{F}(x,y,z) = (-y, -x, -3)$. Is $\mathbf{F}$ a conservative vector field? If so, find a real-valued function V such that $\mathbf{F} = -\nabla V$.