Calc 3: Assignment

Note Title 11/9/2011

① Sketch the following vector fields

a) $\vec{F}(x,y) = \langle 1, x \rangle$

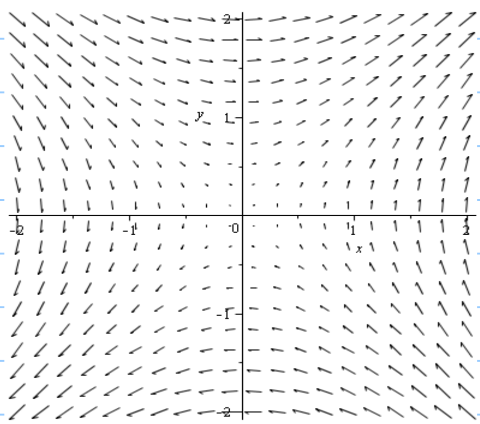
b) $\vec{F}(x,y) = \langle y, \frac{1}{2} \rangle$

c) $\vec{F}(x,y) = \frac{1}{\sqrt{x^2+y^2}} \langle y, x \rangle$

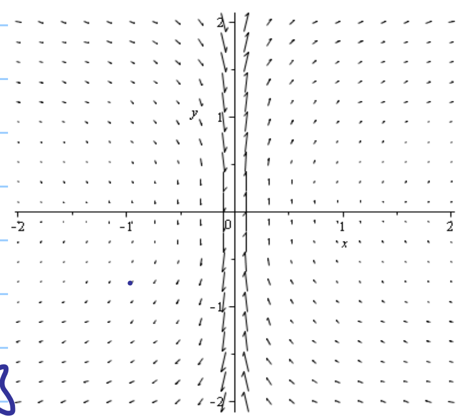
② Match the vector fields with the plots.

a) $F(x,y) = \langle y, \frac{1}{x} \rangle$ b) $F(x,y) = \langle x-2, x+1 \rangle$

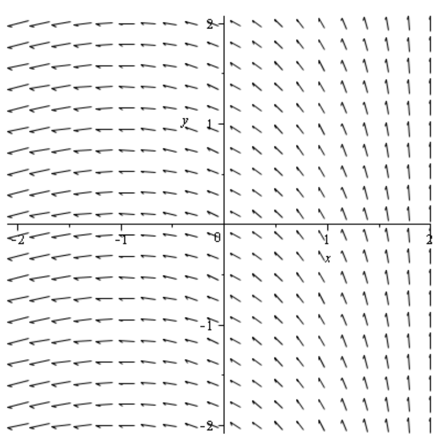
c) $F(x,y) = \langle y, x \rangle$ d) $F(x,y) = \langle 1, \sin(y) \rangle$



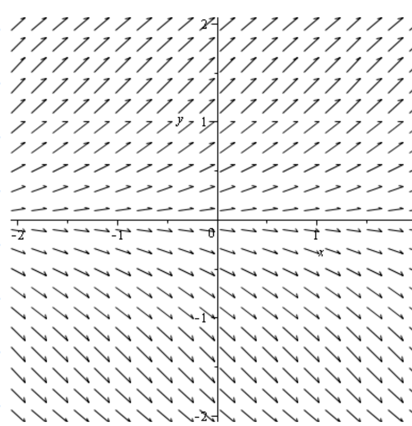
A



B



C



D

4) Use Maple to plot $F(x,y) = \langle y^2 - 2xy,\ 3xy - 6x^2 \rangle$

5) Recall that if $\vec{F} = \langle M, N \rangle$ is conservative, then $\frac{\partial N}{\partial x} = \frac{\partial M}{\partial y}$. Which vector fields are conservative:

a) $\vec{F} = \langle 2x - 3y,\ -3x + 4y - 8 \rangle$

b) $\vec{F} = \langle e^x \cos(y),\ e^x \sin(y) \rangle$

c) $\vec{F} = \langle 3x^2 + 2y^2,\ 4xy + 3 \rangle$

6) For the vector fields in 5 that are conservative, find the potential function

7) Find the curl(F) and div(F) for:

a) $\vec{F} = \langle xyz,\ 0,\ -x^2 y \rangle$

b) $\vec{F} = \langle x^2yz,\ xy^2z,\ xyz^2 \rangle$

c) $\vec{F} = \langle e^x,\ e^{xy},\ e^{xyz} \rangle$

8) Which of these vector fields is conservative:

a) $\vec{F} = \langle y^2 z^3,\ 2xyz^3,\ 3xy^2z^2 \rangle$

b) $\vec{F} = \langle e^z,\ 1,\ xe^z \rangle$

c) $\vec{F} = \langle y\cos(xy),\ x\cos(xy),\ -\sin(z) \rangle$

d) $\vec{F} = \langle 2x^3 - 3x^2y^2 + ,\ 3x^2y^2 - 2x^3y + x \rangle$

If it is conservative, find potential function.

8 If $f: \mathbb{R}^3 \to \mathbb{R}$ is a function and $\vec{F}: \mathbb{R}^3 \to \mathbb{R}^3$ is a vector field, which expression is meaningful:

curl (f)

grad (f)

div (F)

curl (grad (f))

grad (F)

grad (div (F))

div (grad (f))

grad (div (f))

curl (curl (F))

div (div (F))

(grad (f)) × (div (F))

div (curl (grad (f)))