

MATH 251: Practice 20

July 1, 2015

Name: Solutions

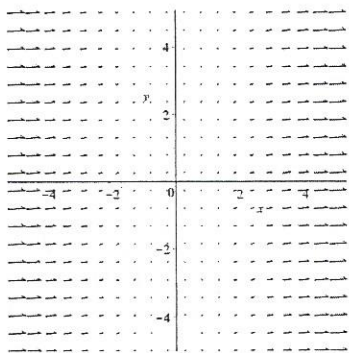
1. Identify the following vector fields

1. $\vec{F}_1 = \langle x, y \rangle$

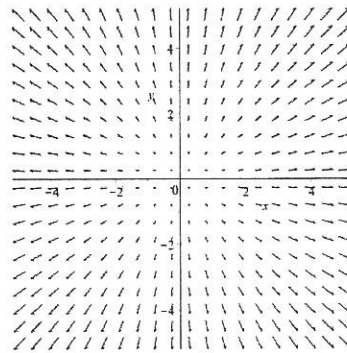
2. $\vec{F}_2 = \langle y, -x \rangle$

3. $\vec{F}_3 = \langle x^2, 1 \rangle$

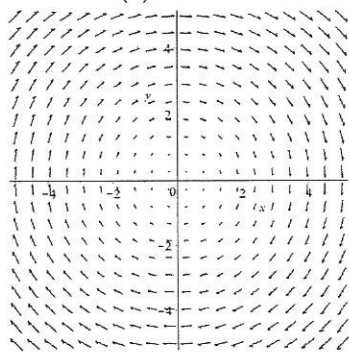
4. $\vec{F}_4 = \langle \sin(y), x \rangle$



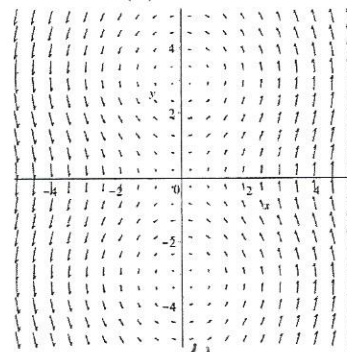
(a) 3



(b) 2



(c) 2



(d) 4

2. Calculate the scalar line integral of the function $f(x, y, z) = x + y$ over the curve $\vec{c}(t) = \langle t, \cos(t), \sin(t) \rangle$ from $t = 0$ to $t = 2\pi$.

$$\vec{c}'(t) = \langle 1, -\sin(t), \cos(t) \rangle$$

$$\|\vec{c}'(t)\| = \sqrt{2}$$

$$\int_0^{2\pi} (t + \cos(t)) \sqrt{2} \, dt$$

$$= \sqrt{2} \int_0^{2\pi} t + \cos(t) \, dt$$

$$= \sqrt{2} \left(\frac{t^2}{2} + \sin(t) \right) \Big|_0^{2\pi} = \frac{\sqrt{2} (2\pi)^2}{2} = \boxed{2\pi^2\sqrt{2}}$$