LESSON 26

MA 26100·FALL 2023

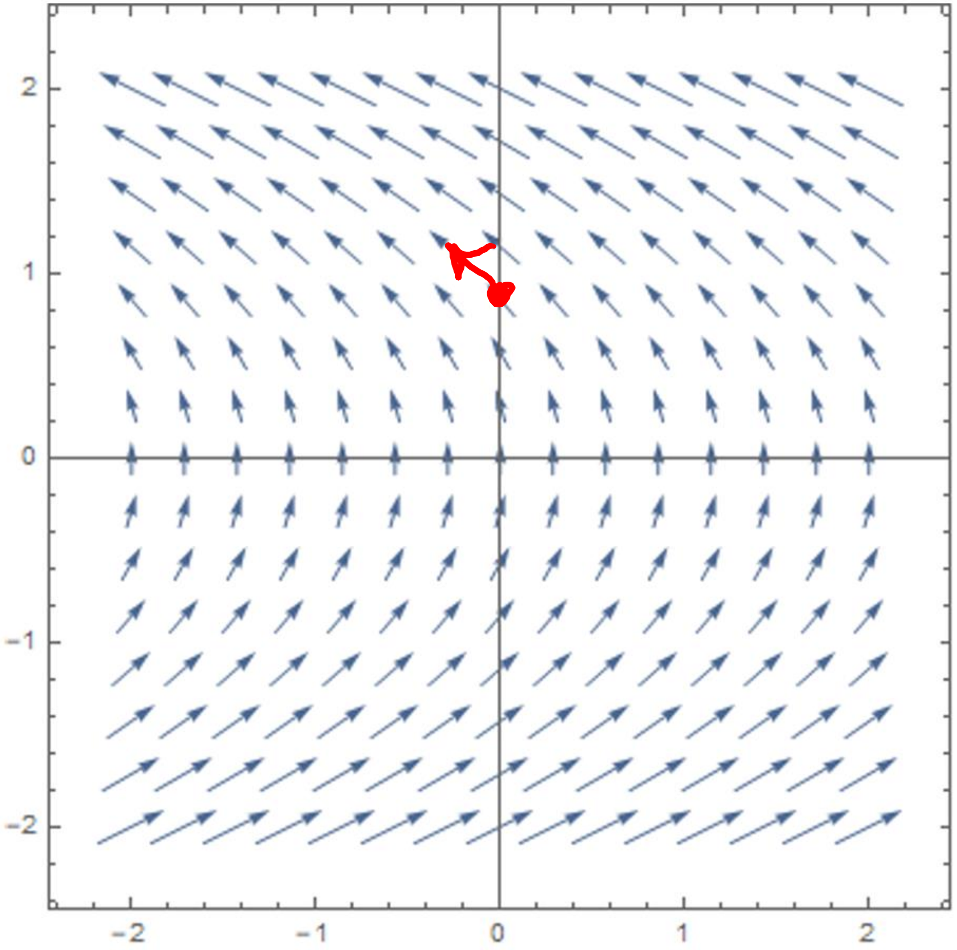
DR. HOOD

WARM UP

(Spring 22 Exam 2 #4)

$\vec{F}(x,y) = \langle P(x,y), Q(x,y)\rangle$

4. Which vector field corresponds to the one pictured here?



~~A. $\vec{F}(x,y) = \langle 1, -y\rangle$~~

~~B. $\vec{F}(x,y) = \langle -x, y\rangle$~~

~~C. $\vec{F}(x,y) = \langle -y, x\rangle$~~

~~D. $\vec{F}(x,y) = \langle 1, y\rangle$~~

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

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

@ (0,1)

E: $v = \langle 1,1\rangle$

F: $v = \langle -1,1\rangle$

vectors point up

$Q(x,y) > 0$

LESSON 26

ANNOUNCEMENTS

- Dr. Hood must leave promptly after the 4:30pm class to substitute for another class

POLL 1

Find the value of $\int_C f(x,y)ds$ where C is the curve parameterized by $\vec{\boldsymbol{r}}(t) = \langle t, t \rangle$ for $0 \leq t \leq 1$.

$f(x,y) = x+y$

$|\vec{r}\,'(t)| = |\langle 1,1 \rangle| = \sqrt{1^2+1^2} = \sqrt{2}$

$\int_0^1 (t+t)\sqrt{2}\,dt = 2\sqrt{2}\int_0^1 t\,dt$

$= 2\sqrt{2}\left[\frac{t^2}{2}\right]_0^1 = \sqrt{2}$

a) 2

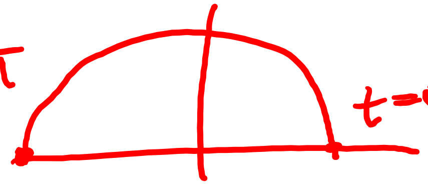
b) 1

c) $\sqrt{2}$

d) $2\sqrt{2}$

POLL 2

Evaluate the line integral $\int_C x^2 y \, ds$ where C is the top half of the circle $x^2 + y^2 = 4$.



$\vec{r}(t) = \langle 2\cos(t), 2\sin(t) \rangle$

$0 \le t \le \pi$

$|\vec{r}\,'(t)| = |\langle -2\sin(t), 2\cos(t) \rangle| = 2$

$$\int_0^{\pi} (2\cos(t))^2 \, 2\sin(t) \cdot 2 \, dt = 16 \int_0^{\pi} \cos^2(t)\sin(t)\, dt$$

$u = \cos(t)$ @ $t=0$ $u=1$

$du = -\sin(t)$ @ $t=\pi$ $u=-1$

$$-16\int_1^{-1} u^2 \, du = -16\left[\frac{u^3}{3}\right]_1^{-1} = -16\left[-\frac{1}{3} - \frac{1}{3}\right] = \frac{32}{3}$$

a) $\frac{16}{3}$

b) $\frac{32}{3}$

c) $\frac{8}{3}$

d) $\frac{2}{3}$

POLL 3

Find $\int_C xe^{yz}\,ds$ where C is the line segment from the point $(0,0,0)$ to $(1,2,-2)$.

a) $\frac{3}{8}(1-e^{-4})$

b) $\frac{3}{8}e^{-4}$

c) $\frac{3}{4}(e^{-4}-1)$

d) $\frac{3}{4}e^{-2}$

direction vector $\vec{v} = \langle 1, 2, -2 \rangle$

point $P = (0,0,0)$

$\vec{r}(t) = \langle t, 2t, -2t \rangle \quad 0 \le t \le 1$

$|\vec{r}'(t)| = |\langle 1, 2, -2 \rangle| = 3$

$$\int_0^1 t\, e^{2t(-2t)}\, 3 \cdot dt = 3\int_0^t t e^{-4t^2}\, dt$$

$u = -4t^2$

$du = -8t\,dt$

$$= -\frac{3}{8}\int_0^{-4} e^u\, du = \frac{3}{8}\left[1 - e^{-4}\right]$$

POLL 4

(Spring 23 Final Exam #13)

Compute the line integral $\int_C (2x + y)\, ds$ where C is the line segment from $(0,0)$ to $(6,8)$.

$a)$ 80

b) 120

c) 140

d) 100

e) 160

MUDDIEST POINT

What was the muddiest point from today's lecture?

a) Setting up a line integral
b) Parameterizing the curve C
c) Solving the line integral
d) None – understood everything today