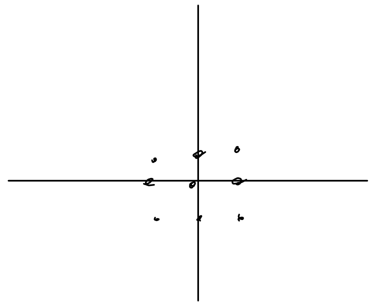
16.1 Plot a vector field.



16.3

16.2 Calculate a line integral

$\langle xy, x^2y^3\rangle \cdot \langle x'(t), y'(t)\rangle dt \quad \vec{F} = \langle P, Q\rangle$

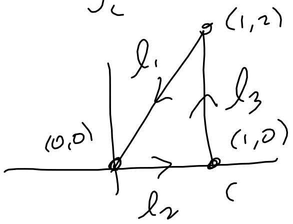
16.5

16.4 $\quad \#3 \int_C xy\,dx + x^2y^3\,dy = \int \vec{F}\cdot d\vec{r} = \int \vec{F}(\vec{r}(t)) \cdot \vec{r}'(t)\,dt$

$= \int_C \langle P, Q\rangle \cdot \langle x'(t), y'(t)\rangle\,dt$

$= \int_C \left(P x'(t) + Q y'(t)\right) dt = \int P x'(t)\,dt + Q y'(t)\,dt$

$= \int_C P\,dx + Q\,dy$

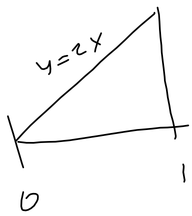


$(1-t)\langle 1,2\rangle + t\langle 0,0\rangle$

$= \langle 1-t, 2-2t\rangle$

$= \langle 1-t, 2(1-t)\rangle$

$$\iint_D (Q_x - P_y)\,dA$$



$$\int_0^1 \int_0^{2x} (2xy^3 - x)\,dy\,dx = \frac{2}{3}$$

§16.5 #13

16.5 $\begin{array}{c} \\ x \end{array} \begin{array}{ccc} x & y & z \\ \langle y^2z^3, & 2xyz^3, & 3xy^2z^2 \rangle \end{array} \begin{array}{cc} x & y \\ y^2z^3, & 2xyz^3 \end{array}$

$\langle 6xyz^2 - 6xyz^2,\ 3y^2z^2 - 3y^2z^2,\ 2yz^3 - 2yz^3 \rangle = \vec{0}$

$f_x = y^2z^3 \Rightarrow f = xy^2z^3 + \overset{g(z)}{g(y,z)} \Rightarrow$

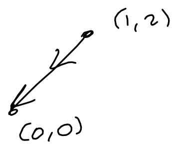
$f_y = 2xyz^3 = 2xyz^3 + g_y(y,z) \Rightarrow g(y,z) = g(z) \Rightarrow$

$f_z = 3xy^2z^2 = 3xy^2z^2 + g'(z) \Rightarrow g'(z) = 0 \Rightarrow g(z) = K = 0$

$\Rightarrow \boxed{f(x,y,z) = xy^2z^3}$

Joseph

$$\int_C xy\,dx$$



$y = 2x$

$(1-t)\langle 1,2\rangle + t\langle 0,0\rangle$

$$\int_0^1 x \cdot 2x \cdot (-dx) = \int_1^0 2x^2\,dx$$ (From Right to Left)

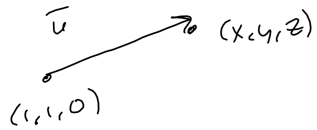
Test 4 Monday

11:00 Keenan, Dylan.

1:30 Joseph

$\bar{n} = \bar{r}_u \times \bar{r}_v$

Let $(x,y,z) \in P \Rightarrow \langle x-1, y-1, z \rangle = \bar{u} \in P.$



$\bar{r} = \langle v, u^2+v^2, u \rangle$

$$\begin{array}{lll} & \bar{r}_u = \langle 0, 2u, 1 \rangle, & 0, 2u \\ \times & \bar{r}_v = \langle 1, 2v, 0 \rangle, & 1, 2v \\ \hline & \langle -2v, 1, -2u \rangle & \end{array}$$

$\Rightarrow$ @ $(1,1,0)$:

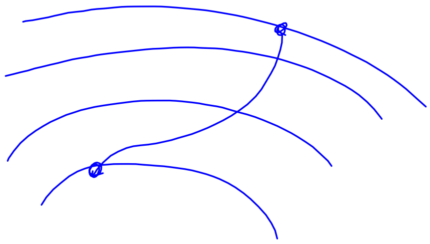
$v = 1$
$u^2+v^2 = 1$ $\rightarrow$ $u=0, v=1$
$u = 0$

$\Rightarrow \bar{r}_u \times \bar{r}_v = \langle -2, 1, 0 \rangle = \bar{n}$

Then $\bar{n} \cdot \bar{x} = 0$

$\langle -2, 1, 0 \rangle \cdot \langle x-1, y-1, z \rangle = 0$

is an eq'n of that tangent plane.



Fundamental Thm of Line Integrals.

Show Conservative.

Find f

Eval. $\int_C \bar{F} \cdot dr = \int_C \nabla f \cdot d\bar{r} = f(\bar{r}(b)) - f(\bar{r}(a))$

Green's $\int_C \bar{F} \cdot d\bar{r} = \iint_D (Q_x - P_y)\, dA = \iint_D \text{curl}\, \bar{F} \cdot \bar{k}\, dA$

Stokes' $\int_C \bar{F} \cdot d\bar{r} = \iint_D \text{curl}\, \bar{F} \cdot \bar{n}\, dS$

$= \iint_D \text{curl}\, \bar{F} \cdot (\bar{r}_u \times \bar{r}_v)\, dA$

$\nabla^2 f$ -vs- $\nabla^2 \vec{F} = \nabla^2 \langle P, Q, R \rangle$

$\nabla \cdot \nabla f$ $= \langle \nabla^2 P, \nabla^2 Q, \nabla^2 R \rangle$

$\nabla \cdot \langle f_x, f_y, f_z \rangle$

$= f_{xx} + f_{yy} + f_{zz}$