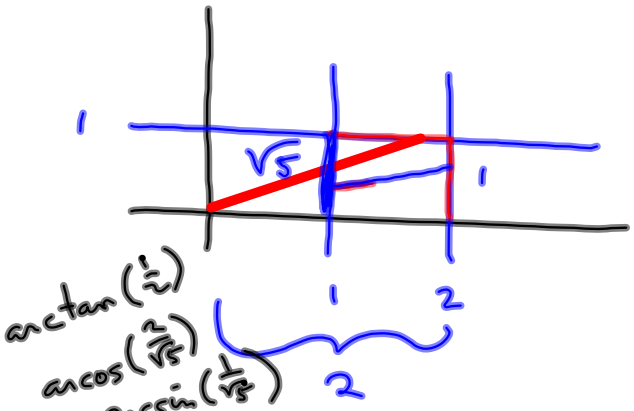
$$\int_0^1 \int_1^2 \frac{x}{x^2+y^2}\,dx\,dy$$

$x = r\cos\theta$

$y = r\sin\theta$

$dA = dx\,dy = r\,dr\,d\theta$



$\theta = \arcsin\left(\frac{1}{\sqrt{5}}\right)$

$x = 1 = r\cos\theta$

$\Rightarrow r = \sec\theta$

$x = 2 = r\cos\theta$

$r = 2\sec\theta$

$y = 1 = r\sin\theta$

$r = \csc\theta$

$\arctan\left(\frac{1}{2}\right)$

$\arccos\left(\frac{2}{\sqrt{5}}\right)$

$\arcsin\left(\frac{1}{\sqrt{5}}\right)$

$$\int_0^{\arcsin\left(\frac{1}{\sqrt{5}}\right)} \int_{\sec\theta}^{2\sec\theta} \frac{r\cos\theta}{r^2} \cdot r\,dr\,d\theta$$

$$+ \int_{\arcsin\left(\frac{1}{\sqrt{5}}\right)}^{\frac{\pi}{4}} \int_{\sec\theta}^{\csc\theta} \cos\theta\, r\,dr\,d\theta$$

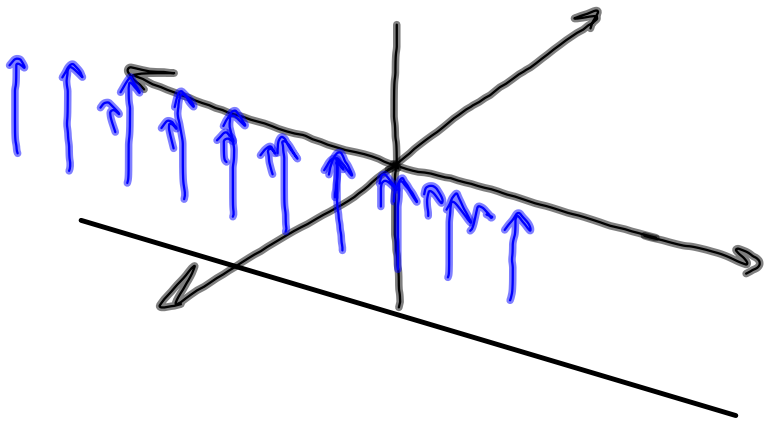
§17.1 Vector Fields

Recall sketching tangent fields?

$y' = f(x,y)$ Drawing arrows to represent tangent vector at (x,y)

$\bar{F} = \langle x(t), y(t) \rangle$

$\bar{F} = x\bar{k} = \langle 0, 0, x \rangle$

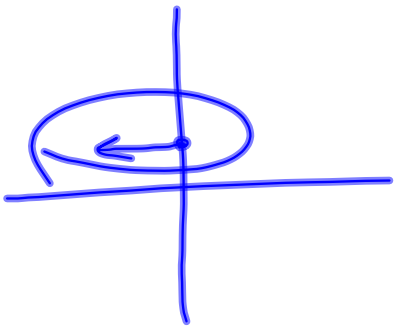


17.1 #s 4, 5, 11 -18 , 19, 23, 24, 28

you might

#4

x	y	$\vec{F}(x,y) = \langle x-y, x \rangle$
1	1	$\langle 0, 1 \rangle$
1	2	$\langle -1, 1 \rangle$
0	1	$\langle -1, 0 \rangle$



§17.2 Line Integrals

§14.3 & 11.2

$$ds = \sqrt{x_t^2 + y_t^2}\, dt$$

$$\bar{r}(t) = \langle x(t), y(t) \rangle$$

$$\int_C f(x,y)\, ds$$

C is a smooth curve

$$\bar{r}(t) = \langle x(t), y(t) \rangle$$

(4) $\int_C x \sin y \, ds$ C is segment from (0,3) to (4,6)

$$\bar{r}(t) = (1-t)\langle 0,3 \rangle + t\langle 4,6 \rangle \qquad 0 \le t \le 1$$

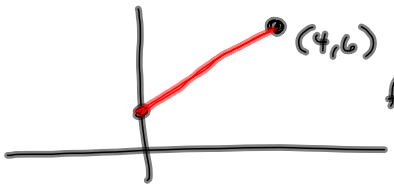
$$= \langle 0, 3-3t \rangle + \langle 4t, 6t \rangle$$

$$= \langle 4t, 3t+3 \rangle = \bar{r}$$

$x = x(t) = 4t$
$y = 3t+3$
} when we're moving from (0,3) to (4,6) along the line segment C

$$\int_0^1 4t \sin(3t+3)\, 5\, dt$$

$$ds = \sqrt{x_t^2 + y_t^2}\, dt = \sqrt{4^2+3^2} = \sqrt{25} = 5$$



$f(4,6) = 4 \sin 6$

#7 $\int_{C_2} xy\,dx + (x-y)\,dy$ where C_2 is the line segment from (2,0) to (3,2)

on C_2,

$x = x$, $y = 2x-4$

$dx = dx$ $dy = 2dx$

$m = \frac{2}{1} = 2$

$y = 2(x-2) + 0$

$y = 2x - 4$

This gives

$$\int_2^3 x(2x-4)\,dx + (x-(2x-4))\cdot 2\,dx$$

$$\int_{C_1} xy\,dx + \int_{C_1} (x-y)\,dy$$

C_1 = segment from $(0,0)$ to $(2,0)$

$y = 0$

$0 \le x \le 2$

$x = x \quad y = 0$

$dx = dx \quad dy = 0\,dx$

This gives

$$\int_0^2 x \cdot 0\,dx + (x-0)\cdot 0\,dx = 0$$

$f(x) = 0$

17.2 #s 5, 11, 15, 23, 27, 32, 37, 44

I'll look for CAS-Dependent probs and throw some stuff in to help you.