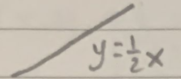
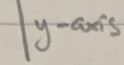
HW 15.6 - 16.1 due 11/8/20

$\boxed{15.6}$

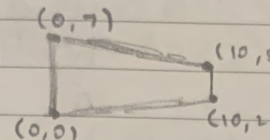
1a) u-axis



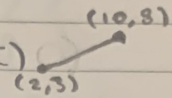
v-axis



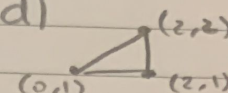
b)



c)

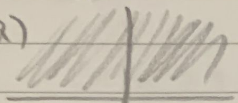


d)



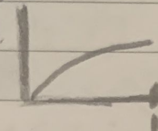
3. G is not one to one, $u \geq 0$ and $u \leq 0$

a)

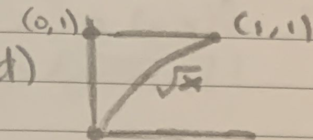


b) $[0,1] \times [-1,1]$

c)



d)



13. $G(u,v) = (3u+4v,\ u-2v)$ $\begin{vmatrix} 3 & 4 \\ 1 & -2 \end{vmatrix} = \boxed{-10}$

15. $G(r,t) = (r\sin t,\ r - \cos t)$, $(r,t) = (1, \pi)$

$\begin{vmatrix} \sin t & r\cos t \\ 1 & \sin t \end{vmatrix} = (\sin^2 t) - r\cos t = \boxed{1}$

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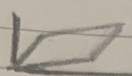
17. $G(r,\theta) = (r\cos\theta, r\sin\theta)$, $(r,\theta) = (4, \frac{\pi}{6})$

$\begin{vmatrix} \cos\theta & -r\sin\theta \\ \sin\theta & r\cos\theta \end{vmatrix} = r\cos^2\theta + r\sin^2\theta = r = \boxed{4}$

19. $[0,1] \times [0,1] \rightarrow$  $\rightarrow \boxed{\langle 4u+2v, u+3v \rangle}$

23a) $G(u,v) = (3u+v, u-2v)$ $R = [0,3] \times [0,5]$

$\begin{vmatrix} 3 & 1 \\ 1 & -2 \end{vmatrix} = -6-1 = -7$ $\iint_R (3u+v+u-2v)7\,dA$

$\rightarrow 7\iint_R (4u-v)\,dA \rightarrow$ bounds are found using $[0,3] \times [0,5]$

$G(R) = 7\iint (4u-v)\,dA \rightarrow \boxed{105}$

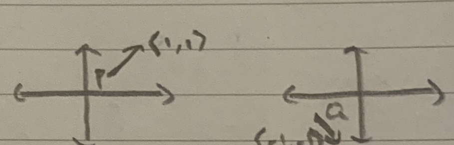
b) $\begin{vmatrix} 3 & 1 \\ 1 & -2 \end{vmatrix} = -7 = \iint (3u+v+u-2v)7\,dA$

Same as a) with bounds being $[2,5] \times [1,7] \rightarrow \boxed{126}$

$\boxed{16.1}$

1. $P = (1,2)$ $Q = (-1,-1)$ $F = \langle x^2, x \rangle$

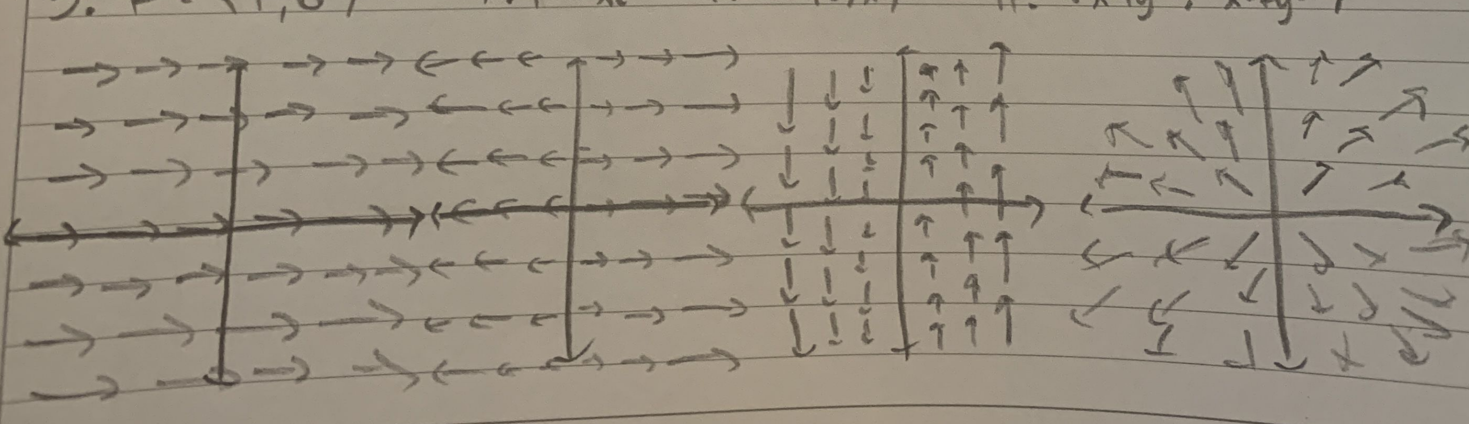
$F(1,2) = \langle 1,1 \rangle$ $F(-1,-1) = \langle 1,-1 \rangle$



3. $P = (0,1,1)$ $Q = (2,1,0)$ $F = \langle xy, z^2, x \rangle$

$F(0,1,1) = \langle 0,1,0 \rangle$ $Q(2,1,0) = \langle 2,0,2 \rangle$

5. $F = \langle 1,0 \rangle$ 7. $F = x\hat{i}$ 9. $F = \langle 0,x \rangle$ 11. $\langle \frac{x}{x^2+y^2}, \frac{y}{x^2+y^2} \rangle$



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17. $F = \langle 1,1,1 \rangle$ Plot c

23. $F = \langle xy, yz, y^2 - x^3 \rangle$ $\quad \nabla \times F \begin{vmatrix} i & j & k \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ xy & yz & y^2-x^3 \end{vmatrix}$

$\nabla \times F = \left[\frac{\partial}{\partial y}(y^2-x^3) - \frac{\partial}{\partial z}(yz)\right]i - \left[\frac{\partial}{\partial x}(y^2-x^3) - \frac{\partial}{\partial z}(xy)\right]j - \left[\frac{\partial}{\partial x}(yz) - \frac{\partial}{\partial y}(xy)\right]k$

curl $F = \langle y, 3x^2, -x \rangle$

div $F = y+z$

25. $F = \langle x - 2zx^2, z - xy, z^2x^2 \rangle$

div $F = 1 - 4zx - x + 2x^2 z$

Curl $F = \nabla \times F = \begin{vmatrix} i & j & k \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ x-2zx^2 & z-xy & z^2x^2 \end{vmatrix} = \langle -1, 2x^2 - 2xz^2, -y \rangle$

27. $F = \langle z - y^2, x + z^3, y + x^2 \rangle$

div $F = 0$

curl $F = \nabla \times F = \begin{vmatrix} i & j & k \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ z-y^2 & x+z^3 & y+x^2 \end{vmatrix} = \langle 1-3z^2, 1-2x, 1+2y \rangle$