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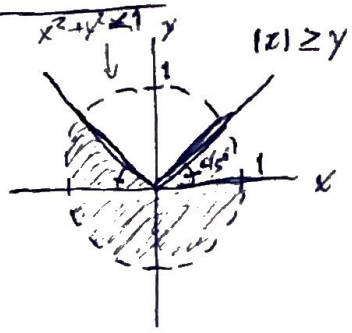
Assignment 1.1

a) D_1



b) Inner points:

$\{(x,y): x^2+y^2 < 1,\ |x|>y\}$

c) Boundary points:

~~$\{(x,y): x^2+y^2 = 1,\ |x|\geq y\}$~~

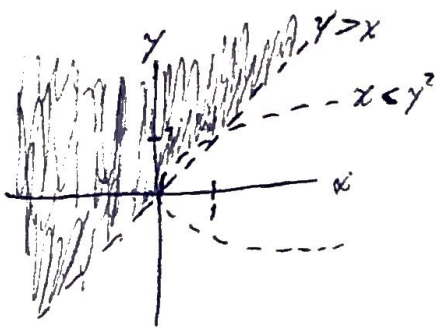
~~OR~~

$x = t$
$y = |t|$ for $-\frac{\sqrt{2}}{2} \leq t \leq \frac{\sqrt{2}}{2}$

$x = \cos(t)$
$y = \sin(t)$ for $\frac{\pi}{4} < t < \frac{3\pi}{4}$

d) Neither open nor closed

a) D_2



b) Inner points:

$\{(x,y): x<y^2,\ y>x\} = D_2$

c) Boundary points:

$x = t$ for $-\infty < t < 0$
$y = t$ and $1 < t < \infty$

$x = t^2$ for $0 \leq t \leq 1$
$y = t$

d) Open (inner points $= D_2$)

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Assignment 1.2

a) Intersection between $x^2+y^2+z^2=4$ and $x+y+2z=0$

$x^2+y^2+z^2=R^2$

$R^2=4$

$R=2$

$x=R\sin\varphi\cos\theta$

$y=R\sin\varphi\sin\theta$

$z=R\cos\theta$

$$x+y+2z=R\sin\varphi\cos\theta+R\sin\varphi\sin\theta+2R\cos\theta=0$$

$$=2\sin\varphi\cos\theta+2\sin\varphi\sin\theta+4\cos\theta=0$$

$$=\boxed{2\sin\varphi(\cos\theta+\sin\theta)+4\cos\theta=0}$$

b) $x=r\cos\theta$

$y=r\sin\theta$

$z=z$

$x^2+y^2+z^2=4 \Rightarrow r^2\cos^2\theta+r^2\sin^2\theta+z^2=4$

$r^2(\cos^2\theta+\sin^2\theta)+z^2=4$

$r^2+z^2=4 \Rightarrow r^2+z^2-4=0$

$x+y+2z=0 \Rightarrow r\cos\theta+r\sin\theta+2z=0$

$r^2+z^2-4=r\cos\theta+r\sin\theta+2z$

$r^2-r(\cos\theta+\sin\theta)+(z^2-2z+1)=4+1$

$r^2-r(\cos\theta+\sin\theta)+(z-1)^2=5$