CS547 HW3 Group37

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Single Quadrant Case (1st quadrant)

Alternative Representation 1:

$$egin{aligned} \mathbf{1}_{\mathbb{R}_+} imes \mathbb{R}_+ & (x,y) pprox s_{arepsilon}(s_{arepsilon}(-s_{arepsilon}(-x)+s_{arepsilon}(y)-rac{1}{2})-rac{1}{2}) \ M^{(1)} &= egin{bmatrix} -1 & 0 \ 0 & 1 \end{bmatrix} igg/ arepsilon & B^{(1)} &= egin{bmatrix} 0 \ 0 \end{bmatrix} \ M^{(2)} &= egin{bmatrix} -1 & 1 \ 0 & 0 \end{bmatrix} igg/ arepsilon & B^{(2)} &= egin{bmatrix} -rac{1}{2} \ 0 \end{bmatrix} igg/ arepsilon & \\ M^{(3)} &= egin{bmatrix} 1 & 0 \end{bmatrix} igg/ arepsilon & B^{(3)} &= -rac{1}{2arepsilon} & \\ \end{array}$$

Alternative Representation 2:

$$egin{align} \mathbf{1}_{\mathbb{R}_+} imes\mathbb{R}_+ & (x,y)pprox s_{arepsilon}(s_{arepsilon}(s_{arepsilon}(x)-s_{arepsilon}(-y)-rac{1}{2})-rac{1}{2}) \ M^{(1)} &= egin{bmatrix} 1 & 0 \ 0 & -1 \end{bmatrix}igg/arepsilon & B^{(1)} &= egin{bmatrix} 0 \ 0 \end{bmatrix} \ M^{(2)} &= egin{bmatrix} 1 & -1 \ 0 & 0 \end{bmatrix}igg/arepsilon & B^{(2)} &= egin{bmatrix} -rac{1}{2} \ 0 \end{bmatrix}igg/arepsilon \ M^{(3)} &= [1 & 0] igg/arepsilon & B^{(3)} &= -rac{1}{2arepsilon} \ \end{pmatrix}$$

Alternative Representation 3:

$$egin{align} \mathbf{1}_{\mathbb{R}_+} imes\mathbb{R}_+ & (x,y)pprox s_{arepsilon}(s_{arepsilon}(-s_{arepsilon}(-x)-s_{arepsilon}(-y)+rac{1}{2})-rac{1}{2}) \ M^{(1)} &= egin{bmatrix} -1 & 0 \ 0 & -1 \end{bmatrix}igg/arepsilon & B^{(1)} &= egin{bmatrix} 0 \ 0 \end{bmatrix} \ M^{(2)} &= egin{bmatrix} -1 & -1 \ 0 & 0 \end{bmatrix}igg/arepsilon & B^{(2)} &= egin{bmatrix} rac{1}{2} \ 0 \end{bmatrix}igg/arepsilon \ M^{(3)} &= [1 \quad 0] igg/arepsilon & B^{(3)} &= -rac{1}{2arepsilon} \ \end{pmatrix}$$

Complements of Single Quadrants Case (1st quadrants 0)

Alternative Representation 1:

$$egin{aligned} \mathbf{1}_{\mathbb{R}^2\setminus(\mathbb{R}_+ imes\mathbb{R}_+)} & (x,y) pprox s_{arepsilon}(s_{arepsilon}(-s_{arepsilon}(x)-s_{arepsilon}(y)+rac{3}{2})-rac{1}{2}) \ & M^{(1)} = egin{bmatrix} 1 & 0 \ 0 & 1 \end{bmatrix} igg/arepsilon & B^{(1)} = egin{bmatrix} 0 \ 0 \end{bmatrix} \ & M^{(2)} = egin{bmatrix} -1 & -1 \ 0 & 0 \end{bmatrix} igg/arepsilon & B^{(2)} = egin{bmatrix} rac{3}{2} \ 0 \end{bmatrix} igg/arepsilon & \\ & M^{(3)} = egin{bmatrix} 1 & 0 \end{bmatrix} igg/arepsilon & B^{(3)} = -rac{1}{2arepsilon} & \\ & M^{(3)} = egin{bmatrix} 1 & 0 \end{bmatrix} igg/arepsilon & B^{(3)} = -rac{1}{2arepsilon} & \\ & M^{(3)} = egin{bmatrix} 1 & 0 \end{bmatrix} igg/arepsilon & B^{(3)} = -rac{1}{2arepsilon} & \\ & M^{(3)} = egin{bmatrix} 1 & 0 \end{bmatrix} igg/arepsilon & B^{(3)} = -rac{1}{2arepsilon} & \\ & M^{(3)} = egin{bmatrix} 1 & 0 \end{bmatrix} igg/arepsilon & B^{(3)} = -rac{1}{2arepsilon} & \\ & M^{(3)} = egin{bmatrix} 1 & 0 \end{bmatrix} igg/arepsilon & B^{(3)} = -rac{1}{2arepsilon} & \\ & M^{(3)} = egin{bmatrix} 1 & 0 \end{bmatrix} igg/arepsilon & B^{(3)} = -rac{1}{2arepsilon} & \\ & M^{(3)} = egin{bmatrix} 1 & 0 \end{bmatrix} igg/arepsilon & B^{(3)} = -rac{1}{2arepsilon} & \\ & M^{(3)} = egin{bmatrix} 1 & 0 \end{bmatrix} igg/arepsilon & B^{(3)} = -rac{1}{2arepsilon} & \\ & M^{(3)} = egin{bmatrix} 1 & 0 \end{bmatrix} igg/arepsilon & B^{(3)} = -rac{1}{2arepsilon} & \\ & M^{(3)} = egin{bmatrix} 1 & 0 \end{bmatrix} igg/arepsilon & B^{(3)} = -rac{1}{2arepsilon} & \\ & M^{(3)} = egin{bmatrix} 1 & 0 \end{bmatrix} igg/arepsilon & B^{(3)} = -rac{1}{2arepsilon} & \\ & M^{(3)} = egin{bmatrix} 1 & 0 \end{bmatrix} igg/arepsilon & B^{(3)} = -rac{1}{2arepsilon} & \\ & M^{(3)} = egin{bmatrix} 1 & 0 \end{bmatrix} igg/arepsilon & B^{(3)} = -rac{1}{2arepsilon} & \\ & M^{(3)} = egin{bmatrix} 1 & 0 \end{bmatrix} igg/arepsilon & B^{(3)} = -rac{1}{2arepsilon} & \\ & M^{(3)} = -rac{1}{2arepsilon} & A^{(3)} = -rac{1}{2ar$$

Alternative Representation 2:

$$egin{aligned} \mathbf{1}_{\mathbb{R}^2\setminus(\mathbb{R}_+ imes\mathbb{R}_+)} & (x,y)pprox s_{arepsilon}(s_{arepsilon}(-s_{arepsilon}(x)+s_{arepsilon}(-y)+rac{1}{2})-rac{1}{2}) \ & M^{(1)}=egin{bmatrix} 1 & 0 \ 0 & -1 \end{bmatrix}igg/arepsilon & B^{(1)}=egin{bmatrix} 0 \ 0 \end{bmatrix} \ & M^{(2)}=egin{bmatrix} -1 & 1 \ 0 & 0 \end{bmatrix}igg/arepsilon & B^{(2)}=egin{bmatrix} rac{1}{2} \ 0 \end{bmatrix}igg/arepsilon \ & M^{(3)}=egin{bmatrix} 1 & 0 \end{bmatrix}igg/arepsilon & B^{(3)}=-rac{1}{2arepsilon} \end{aligned}$$