Set Practice Problems

For 1-6:

- Circle each of the things (a-f) that are elements of the set.
- Draw a line under each thing that is a subset of the set
- Write one more example of an element of the set.

1. $\mathbb{Z}\times\mathbb{Q}$

a. 3 b. $(3,3)$ c. $\left(3,\frac{1}{2}\right)$ d. $\left(\frac{1}{2},\frac{1}{2}\right)$ e. $\{(1,2),(2,0.5),(1,-3)\}$ f. $\{(x,y)\mid x=3, y\in\mathbb{Z}\}$

2. $2^{\mathbb{Q}}$

a. 3 b. $\{3\}$ c. $\{\}$ d. $\mathbb{Z}$ e. $\left\{\frac{1}{n}\middle| n\in\mathbb{N}\right\}$ f. $\{\{x,-x\}\mid x\in\mathbb{Z}\}$

3. $2^{\mathbb{R}\times\mathbb{R}}$

a. $\sqrt{2}$ b. $(\sqrt{2},\sqrt{2})$ c. $\{(\sqrt{2},\sqrt{2})\}$ d. $\{\{(\sqrt{2},\sqrt{2})\}\}$

e. $\{(a,b)\mid a,b\in\mathbb{Z}\}$ f. $\{\{(x,y)\mid x,y\in\mathbb{R}, x^2+y^2=r^2\}\mid r\in\mathbb{R}\}$

4. $L=\{\{(x,y)\mid ax+by=c, x\in\mathbb{R}, y\in\mathbb{R}\}\mid a,b,c\in\mathbb{R}\}$ = the set of lines in the plane

a. $\{(0,y)\mid y\in\mathbb{R}\}$ b. $\{y\mid y=0\}$ c. $\{(x,y)\mid y=3x\}$ d. $\{\{(x,y)\mid x\in\mathbb{R}\}\mid y\in\mathbb{R}\}$

e. $\{\{(x,y)\mid x,y\in\mathbb{R}, y=mx\}\mid m\in\mathbb{R}\}$ f. $\mathbb{R}\times\mathbb{R}$

element is a line

5. $C^1(\mathbb{R})=\{f:\mathbb{R}\to\mathbb{R}\mid f \text{ is differentiable}\}$

a. $f(x)=3$ b. $f(x)=x^2+4x$ c. $f(x)=\frac{1}{x}$ d. $\{f(x)=mx\mid m\in\mathbb{R}\}$

e. $f(x)=\sqrt{x}$ f. L from problem 4

6. $S^1=\{(x,y)\mid x,y\in\mathbb{R}, x^2+y^2=1\}$

a. $(1,0)$ b. $\{(0,1)\}$ c. $\{(\sin x,\cos x)\mid x\in\mathbb{R}\}$ d. $\{(|\sin x|,\cos x)\mid x\in\mathbb{R}\}$ e.(0,0) f. $\{\}$

For 7-9, write an element in each set:

7. $\mathbb{R}\times\mathbb{R}\times\mathbb{R}$ 8. $C^1(\mathbb{R})\times\mathbb{R}$ (see #5) 9. $S=\{\{(x,y)\mid x,y\in\mathbb{R}, x^2+y^2=r^2\}\mid r\in\mathbb{R}\}$

$(1,2,3)$ $(f(x)=x, 1)$ $\{(x,y)\mid x,y\in\mathbb{R}, x^2+y^2=25\}$